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PUBLIC HEALTH.

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THIRD REPORT

OF

THE MEDICAL OFFICER OF THE PRIVY  
COUNCIL,

1860.

*(Presented pursuant to Act of Parliament.)*

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*Ordered, by The House of Commons, to be Printed,*  
*15 April 1861.*

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TO THE LORDS OF HER MAJESTY'S MOST  
HONORABLE PRIVY COUNCIL.

MY LORDS,

IN obedience to the Public Health Act, 1858, I beg leave to lay before your Lordships, for presentation to Parliament, my subjoined Report of the proceedings which your Lordships, under that Act, directed to be taken during the year 1860.

I have the honour to be,

My Lords,

Your Lordships' humble Servant,

JOHN SIMON.

Council Office, Whitehall,

March 31, 1861.

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## MEDICAL OFFICER'S REPORT.

THE principal proceedings taken by the Privy Council during the year 1860 in matters relating to the Public Health may be described under three heads:—

Subject-matter  
of proceeding.

first, on occasion of various LOCAL OUTBREAKS OF DISEASE (viz. of typhoid fever, of diphtheria, and of small-pox) *inquiry has been made, and advice given* ;

I.  
Local Epide-  
mics.

secondly, *systematic inquiries* have been made with reference to VACCINATION,—viz., both as to the *working of the Vaccination Extension Act of 1853*, and also as to the *observance of those regulations\** which the Privy Council has recently made for the improvement of public vaccination ;

II.  
Vaccination.

thirdly, in further pursuance of a course, entered upon in the previous year, of ascertaining in detail what are the LOCAL INFLUENCES WHICH OCCASION IN PARTICULAR DISTRICTS OF ENGLAND AN HABITUALLY HIGH MORTALITY FROM PARTICULAR DISEASES, *inquiry has been made into the special causes which develop pulmonary disease in various manufacturing districts.*

III.  
Habitually  
high local  
death-rates.

And there have been proceedings, of minor importance, under other miscellaneous heads.†

Miscellaneous.

### I.—LOCAL EPIDEMICS.

THE epidemics which during the year have required their Lordships' interference have been epidemics (as above mentioned) of typhoid fever, of diphtheria, and of small-pox. The several epidemics must presently have separate notice. But,

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demics.

\* These regulations, having been established by an Order of Council of December 1, 1859, were reported in my last Annual Report. They came into operation on the first day of the year 1860.

† Among these there was one which involved local inquiry. It related only to a drainage-nuisance at Stafford ; but the application made to the Privy Council on the subject was accompanied by a statement signed by the consulting physician of the Prison, by the medical superintendent of the Lunatic Asylum, and by the senior surgeon of the General Infirmary, to the effect that the alleged nuisance was "injurious to the health of the inhabitants of the neighbouring houses, and more or less so to that of the permanent residents of the large county establishments" to which the certifiers are attached.



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I. Local Epidemics.

General tenor  
of advice given  
to authorities  
where there has  
been Epidemic  
Disease.

first, for the avoidance of repetition, I here state what was common to all of them; viz., that in each case there was given to the Local Authority such advice as the particular local circumstances showed necessary. So far as these circumstances were different, the advice varied of course in its details. But throughout, where any one disease had to be spoken of, the advice was in principle the same. And therefore, instead of quoting the several letters of advice in connection with the respective cases, I refer, once for all, to the annexed "General Memorandum on proceedings which are advisable in places attacked or threatened by epidemic disease,"—a memorandum which, with their Lordships' approval, I have prepared for popular use, and which, *aptatis aptandis*, may be taken to represent the general tenor of their Lordships' advice in the many particular cases. See Appendix, No. I.

### 1. Typhoid Fever.\*

Local inquiries in reference to epidemics of typhoid fever have been necessary in the cases of *Bedford, Bath, Kingston-*

1. Typhoid  
Fever.

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\* Since I last reported generally on the subject of typhoid fever (Report 1858) an addition has been made to the literature of that disease, by the publication ("Lancet," July 1859—March 1860) of a series of papers by Dr. William Budd, of Bristol. Dr. Budd's opinions, as regards the causation of typhoid fever, are as follows:—that the fever is essentially contagious; that the living human body is the soil in which the specific poison breeds and multiplies; that all the emanations from the sick are infectious; that by far the most virulent part of the specific poison by which the contagion takes effect is cast off by the diseased intestine of the fever-patient; that the characteristic affection of the bowel in the disease is, in reality, the specific eruption of a contagious fever; that the sewers and other places into which all this virus passes are the principal channels through which this fever is propagated; that they propagate it solely in consequence of being the channels for the diffusion of this poison; that it no more is the offspring of common sewage than mildew is the actual offspring of damp and decay; and that "by placing two ounces of caustic solution of chloride of zinc in the night-stool on each occasion before it is used by the fever patient, the intestinal discharges may be entirely deprived of their contagious powers." To anticipate some arguments which might be urged against parts of this doctrine, Dr. B. observes, that typhoid fever scarcely ever re-attacks a person who has once suffered it; and that, "like malignant cholera, dysentery, yellow fever, and others that might be named, this is one of the great group of diseases which infect the ground."

The facts which Dr. Budd adduces from his own experience and from that of other observers are, in my opinion, sufficient to prove that the contagium of typhoid fever is importable by persons who have the disease:—indeed on this point Dr. Budd's history of the North Tawton fever and its off-shoots (Lancet, July 9) is more conclusive than anything previously known to me. And his arguments are also, I think, cogent to this general effect,—that specially the bowel-discharges of the disease are means (yet not therefore necessarily the sole means) by which a patient, whether migrating or stationary, can be instrumental in spreading the infection of typhoid fever. Provisionally these conclusions must be acted upon in their present unqualified form. But doubtless it is of practical importance to learn, as exactly as possible, whether it is in all states and under all circumstances, or only in certain states and under certain circumstances, that the bowel-discharges of typhoid fever can effect what is here imputed to them. Typhoid fever seems



*Deverill, and Dronfield.* And with respect to minor outbreaks of fever, there has been correspondence with the Local Authorities of several other places; viz., of *Easingwold, Docking, Calstock, West Shefford, Debenham, Barham, Easton, Lowton, Faringdon, Hildersham, Seavington, St. Mary Cramlington, East Bradenham, and Clavering.*

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REPORT.

I. Local Epidemics.

1. Typhoid Fever.

a.—The case of BEDFORD is one of special importance. Early in the year the attention of the Privy Council was called by the Registrar General to a statement, made to him by one of the Registrars of the district of Bedford, to the effect that fever (which, the Registrar believed, was always more or less prevalent in the district) had during the last few weeks of 1859 prevailed there to an unusual extent. Receiving from other quarters information generally corroborated

a. In Bedford.

to be, in its causes as in its nature, very intimately related to other diarrhoeal infections. And with reference to the possibility of its being only contingently contagious, I quote, for illustration's sake, from my report of 1858, the following passage referring to epidemic cholera:—"Some interesting and important experiments made in 1854 by Professor Thiersch, of Erlangen, seemed to show that cholera evacuations *in the course of their decomposition* acquire a contagious property. It is much to be regretted that experiments were not simultaneously conducted by Professor Thiersch, with a view to determine whether ordinary fæces, or ordinary diarrhoeal fæces, *undergoing decomposition during an epidemic period*, would not likewise have acquired that property; for the prevalence of exterior conditions, which tend to determine in certain localities a specific infectious decomposition of excrement, seems to be the essence of an epidemic period. That this decomposition may begin in bowels, as well as in cesspools, seems possible enough; and perhaps herein lies the explanation of the many cases in which human intercourse has apparently diffused the disease. For, according to the observations of Professor Pettenkofer at Munich, and Professor Acland at Oxford, it would seem that during cholera-periods the immigration of persons suffering diarrhoea has been followed by outbreaks of cholera in places previously uninfected; and Professor Pettenkofer ascribes this fact to an infective influence exerted by the fæces of such persons in the cesspools and adjoining soil of ill-conditioned places to which they go. An infection of this kind would probably extend itself to the polluted well-waters of such soils, and might render them, if swallowed, capable of exciting cholera by direct contagion. It is encouraging to sanitary reformers to observe that cases of apparent introduction of cholera-contagion by human intercourse, are essentially different from such cases of infection as are presented by measles or small-pox. The multiplication of poison in the latter diseases takes place exclusively within the human body; it has no immediate dependence on differences of medium, and wherever human beings can cross one another's path, the susceptible person may contract infection. But the cholera-poison, if indeed it can at all be multiplied within the body, almost certainly has its great centres of multiplication elsewhere, in those avoidable foci of corruption where excrement accumulates and decays. And likewise for diffusing its contagion, if truly the disease be contagious, foulness of medium seems indispensable. Indeed, it is no ordinary foulness which taints air or food or water with the leaven of decaying excrement. Therefore, as regards cholera, it seems highly probable that the immigration of infected persons might occur to any extent without exciting epidemic outbreaks, if it occurred only into places of irreproachable sanitary conditions, especially as regards the supply of water, and the continuous removal of house-refuse. Compare Pettenkofer über die Verbreitungsart der Cholera, 1854; Acland on the Cholera at Oxford, 1856; and Thiersch's *Infectionsversuche an Thieren mit dem Inhalte des Cholera-darmes*, 1856." Papers relating to the Sanitary State of the People of England.



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demics.

1. Typhoid  
Fever.

a. In Bedford.

tive of the Registrar's statement, and having communicated on the subject with the Mayor of Bedford, the Privy Council deemed it necessary to inquire with some minuteness into the circumstances of the alleged recent epidemic. And the Inspector (Dr. Whitley) whom, for this purpose, under their Lordships' orders, I instructed to make the local investigation, reported to me certain facts which, in my opinion, were of great significance, not alone with regard to the actual epidemic, but equally with regard to the permanent sanitary well-being of the district.

First, namely, it appeared that, though fever had been extensively prevalent during the latter part of 1859, an extensive prevalence of the disease was not peculiar to this year; that in short it was the autumnal habit of the town to suffer typhoid fever. Further, it had not appeared that the distribution of the disease, at least during the late epidemic, had, as sometimes happens, corresponded with the ramification of particular sewers. Nor had it appeared, although Bedford is a town of cesspools, that the entrance of cesspool-air into houses had in this case determined the distribution of the fever.

Under these circumstances, suspicion attached to the water-supply. And on my submitting to Professor Miller for chemical analysis specimens of water taken from three different wells within the infected area, I received his report that the waters, judged by their chemical qualities, must have been derived "from a source largely contaminated with decaying animal matter."

There could be little doubt as to the meaning of this contamination. Five years before, in a report made to the General Board of Health (then under the presidency of Sir Benjamin Hall) the circumstances of the Bedford water-supply had been thus described:—"In the valley of the River Ouse, which  
" passes through the town, there is a considerable deposit of  
" porous alluvium between the limestone and the surface  
" of the ground; this alluvium contains water, called land-  
" springs, but really only soakage-water, held up by the ob-  
" structions placed across the river. A great number of the  
" water-wells only go down into the soakage; and more than  
" 3,000 cesspools are said to go into the same. *The water*  
" *both in cesspools and in wells is said to rise and fall with the*  
" *river, on the gravel substrata in the lower part of the town.*"  
There could be little doubt but that this filthy state of things had been let remain substantially unchanged; that the  
" decaying animal matter" which Professor Miller found



affecting the drinking-water of Bedford was such matter as a properly constructed system of sewerage ought long ago to have been draining away from the town.

That there might be no uncertainty on the subject, Mr. Austin, Principal Engineer of the Local Government Act Office, was, at their Lordships' request, directed by Sir G. C. Lewis to examine and report on the drainage of Bedford. This having been done (see Appendix, No. II) there came out, as the prominent result of Mr. Austin's inquiry, the following statement:—“The subsoil of the town, generally, is gravel for a depth of 8 or 10 feet, resting on the lime-stone rock. . . . The general supply of water for the inhabitants is derived from shallow wells, sunk into this gravel only; the water stands in these wells for the most part within 4 to 6 feet of the surface; . . . Cesspools are almost universal . . . the usual course is to construct these cesspools so that the liquid should soak away from them as rapidly as possible into the surrounding soil . . . The wells from which the inhabitants derive their supply of water for drinking and other purposes are frequently in close proximity with these cesspools . . . . Almost the entire system of sewers, drains and cesspools in this town is one of percolation and saturation of the subsoil; and it is almost impossible, with the liquid refuse of 13,000 people constantly passing into such a limited body of water as would be upheld in these few feet depth of gravel, that any portions of the supply could escape more or less pollution.”

Mr. Austin's report was, by their Lordships' direction, communicated to the Mayor of Bedford.

With it there was also sent to him a report from the Registrar General, showing that in Bedford there occurred every year on an average about 30 deaths from fever and diarrhoeal diseases; to account for which number of deaths there must have been attacked every year, by the same diseases, more or less severely, some hundreds of persons. And it was explained to the mayor that these are the diseases which characteristically belong to places where the sanitary conditions are such as Mr. Austin has discovered in Bedford. At the same time, their Lordships' hope was expressed to the Mayor, that the Town Council, having regard to the credit and prosperity of the town, and to the usefulness of its rich school-foundations, would feel it incumbent on them to take prompt and decisive measures for abating the very serious danger which had now once more been brought under their notice.

In answer to this letter (dated Nov. 13) their Lordships

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1. Typhoid Fever.  
a. In Bedford.



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demics.

1. Typhoid  
Fever.  
a. In Bedford.

were (Dec. 27) informed that the Town Council had determined to appoint a Committee of their body to report on the drainage of Bedford. But, up to the present date, their Lordships have not received any information of the results of this measure.

Meanwhile, to any one who is conversant with medical science, it can only be matter of surprise that Bedford has not hitherto suffered more severely from the diseases which depend on excremental infection of air and water. And the importance of the case depends, in my judgment, even less on the amount of illness which has actually been undergone, than on the danger, still hanging over the population, that, under not improbable circumstances, Bedford may suddenly become the seat of some very violent outbreak of disease.

*b.—Bathwick, Bath.*

b. In Bath.

ABOUT the end of March, Secretary Sir G. C. Lewis ordered to be forwarded to their Lordships a letter written to him by the Rector of Bathwick, a suburb within the borough-boundary of Bath; which letter alleged, that, during the last few months, typhoid fever had been prevalent in more than half of the houses comprised under the address of Bathwick Hill. As their Lordships' attention had three months previously been called to a calamitous outbreak of typhoid fever in a single house situate in another outlying part of the borough of Bath, their Lordships now deemed it necessary to make local inquiry into the circumstances under which fever was prevailing. And, under their Lordships' orders, I instructed an inspector (Dr. Whitley) to make this investigation.

The general result was, first, to establish, that at Bathwick Hill, on and off, for at least eighteen months, typhoid fever had been affecting a well-defined locality, comprising about 50 better-class houses, together with a few cottages; that during this time the disease had visited probably two-thirds of the houses; and that in several instances there had been as many as three or four cases in a single house. Secondly, it was established, that throughout the locality there was operating in a high degree the influence of fæcal putrefaction in air and drinking water;\* sewerage was almost entirely absent; cess-

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\* "Though most favourably situated for draining, there has hitherto been no main sewer, except through a small extent of the lower part of the hill; the drainage taking place almost entirely into cesspools, which are common in some instances to two or three houses. The drains are chiefly composed of roughly-hewn stones, affording great facilities for leakage, and in many cases pass under the houses to reach the cesspools." Inspector's Report.



pools were general ; house-drains, leading to them, were leaking, often beneath the houses ; in house after house stink was complained of ; in not a few of the houses the well-water, drawn from the tainted soil, was spoken of as grossly offensive. The circumstances, in short, were just those which are most congenial to the infections of typhoid fever and cholera.

While inquiring into this epidemic, the opportunity was taken to learn particulars of the other outbreak above alluded to ; where, in a single house in Oldfield Road, on the other side of Bath, there had been six cases of typhoid fever, ending in four deaths. And the connexion of these cases with the epidemic on Bathwick Hill is too important to be left unnoticed.

A young lady, aged 14, had returned to Oldfield Road early in October, from staying on a visit at one of the houses on Bathwick Hill. At the house where she had been staying (a house with drain-stinks and questionable drinking-water) there had been during August and September illness, not regarded as typhoid fever, of two daughters and a servant. About ten days after the young lady's return from this house to her family in Oldfield Road, she was laid up with severe typhoid fever, from which eventually she recovered. About the middle of December her three sisters and her aunt, all resident in the same house, took the same disease, and died of it : a servant of the house was also attacked, but recovered. No other cases of fever were heard of by the inspector as having occurred in the neighbourhood of this house ; and I believe that the contagium of the disease was imported by the young lady, who herself seems to have contracted it during her stay on Bathwick Hill.

It deserves notice, however, that, if such was the fact, the infection spread at Oldfield Road under circumstances identical with the worst of those which existed at its fountain head ; that the contagium was carried into a house where, as in the worst of the Bathwick houses, leaking house-drains were beneath the floor, fæcal vapours in the rooms, and fæcal flavours in the drinking-water.

That under these circumstances typhoid fever would spread, is only what might, with some confidence, have been predicted. For it seems certain\* that with this disease, as with cholera, a power of specific contagion resides in the alvine discharges of the sick :—perhaps not except during their decay ; perhaps, also, not (practically speaking) except through the

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I. Local Epidemics.

1. Typhoid Fever.

b. In Bath.

\* See foot note, p. 2. Generally it may be said that, where any disease is possessed of infective powers, the discharges which characterise the disease are likely to be its chief means of spreading infection.



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demics.

1. Typhoid  
Fever.

b. In Bath.

fermentative influence of that decay on other excrement in cesspools, in drains, in sewage-tainted drinking-water ; but in the present case these qualifying conditions were, it appears, all fulfilled. The unfortunate inmates of the house in Oldfield Road were exposed to whatever power the specific morbid product could exert against them ; whether in its recent state, or during its decay ; whether by direct contagion, or through its fermentative action in polluted air and water.

In answer to the communications which their Lordships addressed to the Town Council of Bath with respect both to the Bathwick epidemic, and to the minor outbreak in Oldfield Road, their Lordships received satisfactory assurances that the Town Council had taken, or was in course of taking, suitable means for abating the very dangerous nuisances which have been described.

*c.—Kingston-Deverill, Mere, Wilts.*

1. Typhoid  
Fever.  
c. In Kingston-  
Deverill.

A COMPLAINT having been made to the Privy Council that fever had for some months been prevalent in the village of Kingston-Deverill, their Lordships, after communicating with the Local Authority, concluded that local inquiry might be useful. Accordingly, under their Lordships' orders, I instructed an inspector (Dr. Whitley) to visit the seat of the epidemic.

From his report (dated May 24, it appeared, that, since September 1859, typhoid fever had been continuously prevalent in Kingston-Deverill ; that out of a population of about 400 persons, 66 had already been attacked, and that six deaths had occurred.

Dr. Whitley, describing the village, says that it "is situated on a thick bed of chalk, and occupies a considerable area, the cottages being built singly, or in small groups, at varying distances from each other. Those on the north side of the village are situated on the slope of the down, which has a considerable inclination at this point. Those on the south side lie lower, near the small stream which runs through the valley ; but I heard no complaints of their being damp. The stream and some water-meadows just outside the village to the east are usually dried up in hot weather." Of the 66 cases of fever "at least three-fourths occurred in the higher or north portion of the village, where all the cottages face the south . . . the cottages are, in many cases, overcrowded, and the ventilation in them bad, because the windows are small, and cannot, with few exceptions, be opened."

With reference to the local beginnings of the fever, Dr.



Whitley collected information to the following effect:—that on September 1st the *first* patient came under medical treatment, a man of the poorest class, an habitual tramp, who for some time before his attack had been absent from home, and must (it seemed) have contracted the disease while on his travels;\* that the *second* case was in the person of this man's mother, who had come from her home, on the other side of the village, to stay with and nurse him during his illness, and herself required medical treatment on September 23; that the *next* patients (September 25 and 30) were two women (one of them living next door, west, to the first infected cottage; the other living in another group† of cottages) who, both of them, had frequented the first infected cottage and had given help in nursing there; that the *fifth* attacked (October 9) was a child of other next-door neighbours (east) of the first patient; that the disease eventually spread to more than 20 cottages, scattered, singly or in little groups, about the large area of the village‡; that in some cases several inmates of one cottage were attacked—father, mother, and even three, four or five children; that the

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1. Typhoid Fever.  
c. In Kingston-Deverill.

\* The cottage where this man was laid up was one (No. 2) of a row of five, situated, says Dr. Whitley, "in the highest portion of the village. Each of them consists of a small unflagged room down-stairs, and two small bed-rooms, and there is no opening either by door or window to the back, with the exception of a small window in one of the bed-rooms at No. 2. The windows in the fronts of these cottages are small, and not made to open. The only privy accommodation here is an open privy a few feet from the back of No. 3, the sewerage from which falls into a shallow open pit, and is removed, I was told, only about once a year. The evacuations from the fever patients were emptied, like the slops generally, into a dust-hole (unboarded in the earth) about 15 feet from the front of the centre cottage, and I was assured that they were removed from the cottages immediately. The water supply comes from a well, distant at least 20 feet from the western end of the row, and the well itself is sunk some 60 feet in the chalk. A bucketful of the water, drawn up in my presence, was brilliantly clear, and, though hard, was perfectly sweet to taste and smell."

† The cottage where this woman lived "was in a very bad state, and consisted of a small unflagged room down-stairs, and one small bed-room, with only one bed for three grown-up females, one of whom, however, lived much from home."

‡ One part of the village, which at the time of the inspector's visit had escaped infection, was a group of single and double cottages, standing at some little distance westward of those first attacked, and on the same level as the hill: they were of a much better class than the first described. On the other hand, in a group of four cottages, some "60 or 70 feet lower on the slope of the down," there were 12 cases: two of these cottages are particularly described by the inspector; one was that mentioned in the last foot note; the other "was of rather a better kind. . . with two good sized bedrooms, the windows in which could be opened": "for this group of cottages there was a privy, situated from 20 to 30 feet down the hill, a deep well just in front of the cottages, and dust-holes similar to those described for the cottages first attacked." Fourteen cases occurred in a row of four cottages, of which, Dr. Whitley says, that they were among the best in the place, having been recently built, and at first used as almshouses; they "consisted of a good sized room (floored) below, and a bedroom 15 feet by 13, with two windows, one of which could be opened. The water supply and privy accommodation here are the same as in the last-described group."



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c. In Kingston-  
Deverill.

infection of the disease was, in at least one instance, conveyed to a neighbouring village.\*

It needs not be said that the sufferings of the people were very great. A sixth part of them contracted the disease. Typhoid fever is apt to run a long and exhausting course with those whom it attacks. The inspector incidentally mentions, that at the time of his visit a husband and wife whom he saw, and who had been attacked three months previously, "still presented the characteristic appearance of persons slowly convalescing from typhoid fever."

There are facts in this case which at first seem difficult to explain. Whence was it that the local infection got such strength as to affect a sixth part of the population? The evidence that a first contagium of the disease was personally imported, and that the next victims were persons in domestic communication with the importer, is indeed almost as conclusive as such evidence ever can be. And there were some local circumstances favourable to the spread of personal contagion:—especially there prevailed extensively in the village that monstrous fault so common in rural districts, the fault of windows not made to open, the fault of cottages not capable of thorough ventilation.† But, as regards the two chief media through which intestinal contagions are too often filthily dif-

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\* A young man, J. F., who was lodging with his sister in Kingston-Deverill, "was taken ill about November 16, and was removed two days later to his mother's at Monckton-Deverill, a village about a mile distant, where he had severe fever, with much purging, which proved fatal. His mother was seized about December 10, and had a very severe attack, with much purging at a late period of the disease. There were three other cases of fever in Monckton-Deverill about this time; but Mr. Rumsey, who saw the cases in both villages, informed me that he could not trace any communication between these and any of the others. A woman, Mrs. N., who lived in an isolated house about a mile distant from Kingston-Deverill, went to Monckton-Deverill to help to nurse J. F., who was her nephew. She was taken ill about December 10, and returned home, where she appeared to be suffering from a mild attack of fever, when peritonitis supervened and proved fatal in three days. A boy, aged 14, who lived in this house, was taken ill about January 5, and removed into the village where he had fever mildly. About January 20 Mrs. N.'s daughter had a mild attack, but with considerable purging." Inspector's Report.

† Defective ventilation can never be an unimportant fault. It is always injurious to health, always aggravative of disease. But, with regard to its explanatory bearing on the spread of contagion at Kingston-Deverill, this also must be noticed;—that defective ventilation does not equally help all communicable diseases to spread; that commonly it seems to operate in proportion as the disease is one which imparts infectiveness to the general exhalations of the sick; and that the significance of the fault is, on this account, not likely to be quite the same, where typhoid fever is the prevailing disease, as where the disease is typhus, scarlatina or smallpox. In the case of typhoid fever, any defect of ventilation would become more and more important in proportion as the bowel-discharges of the sick were not promptly removed from within-doors, or as, from other causes, there were fæcal effluvia in the dwelling; but in Kingston-Deverill, the defects of ventilation do not appear to have been thus aggravated.



I. Local Epidemics.

1. Typhoid Fever.

c. In Kingston-Deverill.

fused—the medium of sewage-tainted drinking-water, and the medium of sewage-tainted breathing-air,—Kingston-Deverill might have seemed to be rather exceptionally well off: for (1) there were several sources of water-supply, and the water was beyond suspicion of foulness; and (2) though there was about the place, as is too common in village-life, an abundance of unremoved filth, yet the cottages were so disconnected from their privies, and were spread over so large an area, that the air within them could not thus have been appreciably polluted. Probably an essential evil was, that no precautions were taken in dealing with the evacuations of the sick,—that these dangerous morbid products were extensively cast on to the common dust-heaps (as doubtless also into the common privies) of groups of houses wherein fever-cases had arisen.

At the time when the facts of this epidemic came under their Lordships' notice, the Local Authority for the removal of Nuisances in Kingston-Deverill was (under the then unamended law) constituted of the guardians and overseers of the poor with the surveyors of highways for the place. As the most convenient course for bringing under notice of this body the defects which had been found in the sanitary state of the village, their Lordships addressed the Board of Guardians of the Mere Union. And the Board in reply assured their Lordships that the parochial authorities, on having their attention drawn to the subject, had promised to do all in their power towards removing local causes of disease.

*d.—Dronfield, Derbyshire.*

THE Board of Guardians of the Chesterfield Union having, in a letter dated November 1st, notified to the Privy Council that typhoid fever had long been severely prevalent in the parish of Dronfield, and their Lordships deeming it necessary to inquire into the circumstances of this case, I, under their Lordships' orders, instructed an inspector (Dr. Ord) to make local examination, and report.

d. In Dronfield.

The resulting information (reported November 15) was to the following effect:—1) that typhoid fever had been prevailing in Dronfield for about six months; 2) that, during this time, among the about 2,500 inhabitants of Dronfield (chiefly coal-miners and their families) there had been 556 reported cases of fever, resulting already in 41 deaths; 3) that no evidence was given as to the contagium of the disease having been imported from any other place, or as to the disease having spread by contagion in Dronfield; 4) that the local conditions



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1. Typhoid  
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under which the fever had been spreading were those of extreme sanitary neglect; and (5) that under these conditions the ordinary death-rate of the population for eight years preceding the present epidemic had been almost double the standard death-rate of rural populations.

The urgent evil at Dronfield was accumulation of animal filth. The filth was in privies, in cesspools, in pigsties, in slaughter-yards, in offal-heaps, in common and private drains, and in the public way. Owing partly to the natural features of the place, partly to the manner in which its houses are built against the very steep sides of a narrow valley, partly to the mal-construction of the houses themselves and of their appurtenances, the accumulated filth was under circumstances which allowed its mischievous results to be more than commonly felt by the population. Great depositories of filth, cesspools, pigsties, offal-heaps, &c. were in the closest proximity to dwellings; commonly with little intermediate ventilation. Sometimes they allowed their drainings to soak through the house-wall against which they were resting, or to pass in imperfectly covered gutters under the floors of inhabited rooms: sometimes they were in dangerous proximity to wells. What refuse was not detained decomposing in the immediate atmosphere of dwellings, tended generally to direct itself into the dammed-up brook of the valley; to which brook two much-frequented wells of the place were so related, that their water was habitually in danger of being polluted with sewage. Among details reported by the Inspector was one, which, notwithstanding its disgustingness, deserves particular notice: he was informed that recently, below one house where typhoid fever was present, a long track of blood, descending the hill-side, marked where the patient's diarrhœal excrements had been thrown, and let run past two rows of houses into the turnpike-road. For reasons already stated (*see* foot note, p. 2) this filthiness was of special danger to the public health.

Their Lordships represented the above facts to the guardians of the Chesterfield Union; expressing at the same time a hope that the guardians would forthwith take proper measures to improve the state of the parish. The guardians had not hitherto been aware that, under the recent amendment of the law, they had become the Local Authority for the removal of nuisances in Dronfield. But having been by their Lordships' letter reminded of this responsibility, they in reply stated that they were beginning, and would promptly proceed, to carry the law into effect.



2. *Diphtheria.*MEDICAL  
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demics.

2. Diphtheria.

ON three occasions during the year, viz. with reference to *Knebworth*, in the Union of Hitchin, to parts of *Chirk* and *St. Martin*, in the Union of Oswestry, and to *Edenhall* and *Langwathby*, in the Union of Penrith, their Lordships saw fit to inquire into the respective circumstances of epidemics of diphtheria.

In Knebworth, with a population of about 250 persons, there had been, between the middle of August and the middle of October, from 30 to 35 cases of some severity (milder cases not being reckoned) and in that number 13 deaths.\*

In the affected parts of Chirk and St. Martin, the local medical practitioner had attended between February and December about 110 cases, distributed among rather more than 50 houses,† and resulting in 21 deaths.

In Edenhall and Langwathby the disease had been recurrent for about twenty months, within which time it had attacked nearly a fifth part of the village population.

The inquiries made in these three cases did not importantly enlarge the too inconclusive information which had been gathered in other inspections‡ with respect to the causation of diphtheria. But in each case sanitary faults were found, which it was thought right to point out to the Local Authority; not with insistence upon them, as the essential causes of diphtheria; but with warning that they were likely to promote the spread of this, as of many other diseases; and with assurance that the amendment of such faults, besides what it might effect in reference to the extension of diphtheria, would in other ways conduce to the healthiness of the affected district.

In illustration of the course thus taken, it may be convenient to give *in extenso* the suggestions which I submitted to their Lordships, and on which their Lordships were pleased to act in the case of Edenhall and Langwathby. They were as follows:—"The report which, under their Lordships' directions, has been made to me by Dr. Ord with respect to the prevalence of diphtheria in the parishes of Edenhall and Langwathby, within the Penrith Union, shows, that, between

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\* A year before, in another parish of the Hitchin Union, there had been an outbreak confined to a single lone house, where, in a family consisting of parents and six children, five children and the mother were attacked, and three children died.

† The entire places contained in 1851, 739 inhabited houses, with about five persons to a house.

‡ See last year's Report.



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2. Diphtheria.

May 1859 and December 1860, there have been three local outbreaks of diphtheria; that, of 109 houses in the two parishes, 52 have been visited by the disease; that, of a total population of about 607 persons, 116 have suffered attacks, viz. 38 adults and 78 children; and that, of the affected persons, 2 adults and 20 children have died.

“ My experience of other epidemics leads me to fear (1) that in Edenhall and Langwathby, where the disease has so long been prevalent, its influence is not yet at an end; and (2) that the disease may probably appear in other parts of the Union than those to which hitherto it has been confined.

“ I therefore deem it of great importance that, both in the two affected parishes, and generally throughout the Union, all available precautions should be taken against whatsoever may predispose to the disease.

“ I am indeed not able to say what are the causes which first give local rise to diphtheria. But as regards measures which may be deemed precautionary against the extension of the disease in any attacked district, I am of opinion that, in the present state of knowledge, the best course of proceeding is this:—first, to provide, as far as possible, that all inhabited premises be clean, dry, abundantly ventilated, not overcrowded, and not with any filth or damp round about them; secondly, to prevent (especially as regards the young) all unnecessary intercourse with diphtherial patients,—for instance, to keep each sick room free from persons who are not of use or comfort to the sick, and to take care that children with sore throat be not at school with other children.

“ With particular reference to the first class of precautionary measures, it seems desirable that the attention of the Local Authorities should be drawn to certain passages (marked) of the Inspector's report.\* Adverting to these, I think it of urgent

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\* The following extracts from the Inspector's Report include the passages above referred to, and will serve to show what local relations there were between the disease and conditions of dwelling: “ In spite of evident aptness for natural and artificial drainage, Edenhall is asserted to be very damp. . . . At Langwathby the green was formerly occupied by two large ponds fed by springs, and by the drainings from many of the adjoining houses. The ponds were, a few years ago, drained and filled up; but, as I am informed, the drainage was incomplete, owing to the levels not being carried sufficiently deep, so that the green remains very damp. The arrangements also for connecting the new drains with others formerly running to the ponds, do not appear to have been effectual, inasmuch as in more than one instance there is ponding of sewage in the course of the old drains. . . . In the villages very few drains exist, excepting short covered channels to carry off slops. Under-drainage, to prevent damp, is confined to one or two houses. . . . Of circumstances which appear to have been most closely associated with the incidence of diphtheria, dampness and bad ventilation of houses and locality are the most prominent. . . . Of the 52 houses in which cases have occurred, most are defective, either in size, ventilation, drainage, or domestic arrangements. The floors in at



1. Local Epi-  
demics.

2. Diphtheria.

importance that the specified nuisances should as speedily as possible be abated, and that systematic proceedings should forthwith be adopted,—1) for a thorough removal of filth from about dwellings; 2) for a general limewhiting of interiors of dwellings; and (3) for such improvements in the construction of windows as may allow every inhabited room to be well ventilated. It is also much to be wished that, as far as possible, improvement should be made in the present damp flooring of cottages. I am further of opinion, that improvements of land-drainage would greatly conduce to the healthiness of the localities reported on; but as this kind of improvement cannot at once be generally effected, first attention should be given to whatever pondings of fluid are nearest to dwellings; and where the earth close about dwellings is sodden with moisture (which usually will be of a foul description) freshly burnt lime, or powdered freshly burnt charcoal, should be freely strewn over the surface.

“For reasons already stated, I think it important that these proceedings should not be confined to those parts of the Union wherein diphtheria has already appeared, but that the entire district of the Union should be brought into as wholesome a state as possible. Moreover, since diphtheria, where it has once gained footing, sometimes remains fixed in a district even for two or three years, or returns thither again and again, I think it equally important that not any part of the district, after temporary improvement, should be let relapse into an unwholesome state.

“In making the above suggestions, I have not exclusive regard to the prevention of diphtheria. Considering that the un-

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least half of these houses are notably damp, being formed of flags of porous sandstone, resting on the earth, and readily absorbing moisture howsoever presented. After washing and in rainy weather they remain wet for a long time. In many of the cottages there is great deficiency both of light and ventilation, owing to the very small size and immobility of windows. Children living in such dwellings exhibit the sallowness of complexion usual in manufacturing towns, and are evidently unhealthy. In six instances the houses attacked have been large, dry, well ventilated, and without surrounding nuisances. Among the houses hitherto free from diphtheria are several which are damp and in bad condition; but the majority, as compared with houses affected, are well ordered. They include the hall, with 30 inmates, several large farmhouses, the schoolhouse, and many cottages. In the vicarage, containing, among nine persons, four children, a servant in communication with an affected family in the village was attacked with diphtheria. She was at once removed from the house, and the disease did not spread. In connexion with great severity of diphtheria in particular houses, circumstances, rendering the fouling of the air within very probable, have been noted to exist. Several nuisances, evidently injurious to the health of the inhabitants, are present in both villages. . . . The condition of several of the yards adjoining houses, requires interference on the part of the local authority, with regard to cleansing of privies, cow-houses, pigsties and stables.” Numerous details, illustrating these statements, were given in the Report.



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I. Local Epidemics.

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wholesome conditions adverted to are likely to aggravate all common epidemics, and to cause much unnecessary ill health, I am of opinion that, on general sanitary grounds, the suggested course ought to be taken; and that, apart from what service it may render in preventing the extension of diphtheria, it will in various ways conduce to the healthiness of the local population."

3. *Small-pox.*

3. Small-pox.

Unions with which there has been communication on account of small-pox.

DURING the last three or four years, sometimes in one set of places, sometimes in another, there have been occurring, almost generally throughout England, epidemics, more or less considerable, of small-pox. And during the year 1860 their Lordships thought it necessary, with reference to local outbreaks of this disease, to enter into correspondence with the authorities responsible for public vaccination in the several herementioned extra-metropolitan Unions, viz., *Barnet, Luton, South Moulton, Highworth and Swindon, St. Alban's, Caernarvon, St. Thomas, Bosmere and Claydon, Gateshead, Sevenoaks, Cuckfield, Wareham, Hoo, Honiton, Loughborough, Staines, Hatfield, Runcorn, Bath, Newark-on-Trent, Haslingden, Huntingdon, Dover, Plymouth, Woburn, Hoxne, Lewes, Newton Abbot, Newmarket, Wellingborough, St. Neots, Belper, Ipswich, Northampton, Burnley, Norwich, Gravesend and Milton, Chesterfield, Kingsbridge, Aberystwith, Faringdon, Leighton Buzzard, St. Austell, Torrington, Grantham, and Leamington.*

Nature of advice given.

As local circumstances have been different, so, to this extent, have there necessarily been differences between the several letters addressed to the respective authorities. And for other reasons there have been other differences. But the object has, of course, always been the same, that of inducing the local authorities to do within their respective districts all which they properly could do towards procuring obedience to the vaccination law of 1853, and generally towards arresting the local progress of small-pox.\*

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\* Their Lordships' Minute with respect to one of the last cases which occurred during 1860, may be here quoted as illustrating the kind of suggestions which their Lordships, after the year's experience, and having regard to the present state of the law, now find it most suitable to offer:—"Their Lordships are informed that small-pox has for some months been present in the town of Huntingdon; that deaths have recently been occurring there from this disease, and that a death from it has also occurred at Brampton, at some distance from the town.

"Adverting to the fact that the Board of Guardians is not only the local authority for carrying into effect the laws relating to vaccination, but also the local authority on which, in cases of need, it would devolve, under Orders of Council, to carry into effect the provisions of the Diseases Prevention Act, the Lords would beg the



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Inspection  
made in Honi-  
ton, in St.  
Thomas's, in  
Haslingden,  
and in seven-  
teen Unions or  
Parishes of the  
Metropolis.

In some of the above-mentioned cases, viz., with regard to the Unions of Honiton, St. Thomas and Haslingden, there were circumstances under which it was likely that written communications would be insufficient. With regard to these cases, and likewise with regard to 17 Unions and Parishes in the metropolis, I submitted to their Lordships that personal communication through an inspector might be of essential service; that, both for discovering what was defective in local arrangements, and for procuring the adoption of necessary improvements, their Lordships' influence, thus exerted, would be both greatly more rapid and greatly more effectual than any which could be exerted by letter. Their Lordships having hereupon been pleased to give me orders accordingly, I instructed an inspector (Dr. Seaton) to visit, in succession, the enumerated Unions and Parishes, to address himself to local authorities and their officers in the sense of their Lordships' written communications, and to give such detailed advice as was necessary with respect to the best local means for carrying their Lordships' general recommendations into effect.

Board of Guardians to consider whether, by the direct action of their officers, or in any other manner, they can properly do anything which they have not yet done to promote vaccination within their union.

"The kind of proceeding which in other places, under like circumstances, has proved most conducive to this result, and which their Lordships therefore deem generally desirable wherever small-pox is present, consists in the following steps:—

"1) to compare, in detail, the register of successful vaccinations with the register of births; to make inquiry at elementary schools and other establishments having many young inmates, and thus, as far as possible, to learn what children are not yet duly vaccinated;

"2) to give notice to the parents or guardians of such unvaccinated children, warning them of the present danger of small-pox, and reminding them of the provisions of the law;

"3) to see that in the local arrangements for vaccination every desirable facility is given to the public, and that re-vaccination is freely afforded to persons who properly require it; and,

"4) if there appear to be much general neglect of vaccination, to cause public notices, on the plan of the annexed,† to be extensively distributed and placarded throughout the union.

"Their Lordships direct that a letter, in the above sense, be written to the Board of Guardians.

[† Notice.] 'SMALL-POX.

'Cases of small-pox having occurred in this neighbourhood, the attention of the public is drawn to the danger of neglecting vaccination.

'Notice is given that the public vaccinator for this district will attend as below, for the purpose of vaccinating all applicants, viz., at on at o'clock.

'Parents and guardians whose children have not yet been vaccinated as the law directs are advised to avail themselves of the present opportunity.

'They are also warned that, if they neglect to have their children vaccinated as above, they are liable to a penalty of 1 l.

'Grown-up persons who have not been vaccinated since infancy, may, if they wish it, be re-vaccinated by the public vaccinator.

'By order of the  
Date

(signed)

B



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It is not requisite for me to describe the particular circumstances under which small-pox was prevailing in all the several Unions and Parishes communicated with. Those circumstances, where they could be well ascertained, had nothing exceptional in their character :—they were but confirmatory of our common knowledge, that, wheresoever vaccination falls into neglect, small-pox tends to become again the same frightful pestilence as it was in the days before Jenner's discovery; that, wheresoever vaccination is universally and properly performed, small-pox tends to be of as little effect as any extinct epidemic of the middle ages.

Results of  
inspection in  
the Metropo-  
litan Unions.

To illustrate the nature of the proceedings which were taken, where personal communications were had recourse to, I append (App. No. III.) the body\* of the report which Dr. Seaton made to me with respect to the Unions and Parishes of the metropolis. And as regards the results obtained by these communications in London, there are two illustrative facts, which I will here mention :—

First, as regards VACCINATION in the inspected districts, so great was the stimulus given, that for some weeks the parochial vaccinations of previously unvaccinated persons (not to mention the increased proceedings of the National Vaccine Establishment, or those of private practitioners) were carried on at *about five times their average rate*. And besides this very large increase of primary vaccination, adolescents and others with imperfect marks of vaccination were re-vaccinated to an extraordinary extent.

Secondly, as regards SMALL-POX in the *inspected*, as compared with the *uninspected*, districts of the metropolis,—the former, comprising† a population of 1,076,853 persons, suffered 621 deaths; while the latter, comprising† a population of 1,285,383 persons, suffered 1,442 deaths. In other words, the small-pox death-rate of the inspected districts (5·7) was but about half the small-pox death-rate (11·2) of the uninspected districts. Moreover, of the 621 deaths which occurred in the inspected districts, only 231 took place after the inspection had come into effect; when, according to the standard of the uninspected districts, the inspected districts, if

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\* The report has a supplement, which (as consisting of minute local details) it has been deemed unnecessary to insert in this volume.

† That is, according to the census of 1851. This, of course, is now no longer *absolutely* true with reference to either population, but may, in all likelihood, still express with accuracy enough for our present purpose, the *relative magnitudes* of the two populations.



left to themselves, would have suffered about 850, instead of 231, deaths by small-pox.

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In two Devonshire Unions small-pox was being spread by inoculation.

In the two adjoining Devonshire Unions which were visited, (namely, in the Union of Honiton and in that of St. Thomas) it was ascertained that the diffusion of small-pox had been, to some extent, wilfully promoted by the illegal practice of inoculation.\* Alarm was, of course, excited among educated persons in the endangered places by the knowledge that this offence was being committed; and in one case, where there was reason to believe that inoculation had been the cause of death, Secretary Sir G. C. Lewis offered a reward of 50 l., to be paid to any person, not actually concerned in the offence, who would give information and evidence leading to a con-

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\* Thus with regard to part of the St. Thomas's Union Dr. Seaton wrote,—“ In mentioning Woodbury district, I must specially call your attention to an obstacle of the most serious and formidable kind which the medical officer of the district finds to his vaccinating exertions. It is not a mere objection or indifference to vaccination, but a preference for the, I had hoped, long-forgotten, as it has been long-illegal, practice of inoculation—a preference to which, in spite of the law, many of the inhabitants have not scrupled to give practical effect. This, of course, like other illegal acts, is practised with every secrecy and precaution that can be devised; but in the village of Newton Poppleford, in Aylesbeare parish, in this district, I obtained evidence the most conclusive to my mind that it had been systematically carried on, and chiefly by a woman named Down, though probably in some cases by the parents of the children themselves. . . . The evidence I have collected as regards one of these cases I have forwarded to Mr. Bidwell, the clerk to the union. The prosecution in the other case had already been undertaken before my arrival. In one case which came to my knowledge I had reason to believe that death had been the direct result of the practice; and here it was determined by the coroner, R. H. Aberdeen, esq., with whom I consulted on the subject, that an inquest should be held on the body of the child. Legal evidence of inoculation in this case was wanting, and the jury could only find that the child died of small-pox, how caused there was not evidence to determine; but the opinion the jury entertained was manifested in their adding to their verdict a request that the coroner would admonish the mother of the child and Ellen Down.” And with regard to part of the Honiton Union, Dr. Seaton reported,—“ The circumstances attending the introduction of small-pox into Harpford parish, and the way in which they were brought to notice, were these. There is a small hamlet in the parish called Burrow, which immediately adjoins Newton Poppleford, in the St. Thomas's Union. When Mr. Hayman, of Ottery, who is the medical officer of Harpford, heard that a case of small-pox had been brought from Exmouth to Newton Poppleford, and that the disease was beginning to spread there, he was anxious to get the hamlet of Burrow protected by vaccination; but calling at the houses of the people for the purpose, he was met by objections and positive refusal. In consequence of this, the mediation and assistance of the clergyman, the Rev. J. Gatty, were sought; but Mr. Gatty soon reported that the whole hamlet, as well as Newton Poppleford itself, was down with the small-pox. This simultaneous infection of two hamlets could leave no doubt as to the means by which it was induced; but, in truth, it was admitted by many that inoculation had taken place, though no one knew by whom, or when, or where, it had been done in any individual instance. This hamlet is the only place in the union in which I had personal knowledge of, or made personal inquiry into, the practice; but Mr. Hayman had reason for believing that it had been practised at Venn Ottery, and the coroner mentioned to me another parish, in another part of the union, where there was some reason to believe it was being adopted.”



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Facts observed during the epidemic with regard to the unsatisfactory working of the Vaccination Acts.

viction of the offender. The action thus taken was probably of much effect in preventing a continuance of the prohibited practice; but it could not undo the mischief which already had been caused—mischief which was all the greater from the circumstance that, in both Unions concerned, the state of public vaccination was in many respects unsatisfactory.

IN the course of the above-mentioned inquiries relating to epidemics of small-pox, as well as in the course of certain other inquiries (hereafter to be mentioned) which related primarily to local arrangements for vaccination, there transpired abundant evidence of the ambiguities and deficiencies by which, especially in times of difficulty, the Vaccination Extension Act is rendered almost inoperative for its professed purpose.

The law, as laid down in that Act, is,—that every child, its health permitting, shall be vaccinated within three, or, in case of orphanage, within four, months of birth, by the public vaccinator of the district, or by some other medical practitioner; that notice of this requirement, and information as to the local arrangements for public vaccination, shall, whenever a birth is registered, be given by the registrar of births to the parents or guardians of the child; that every medical practitioner who, whether in public or in private practice, successfully vaccinates a child, shall send to the local registrar of births a certificate that he has so done; that the registrar shall keep an account of all certificates thus received; that parents or guardians who, without sufficient reason, either omit to have a child duly vaccinated, or, this being done, omit to have it inspected as to the results of the vaccination, are liable to a penalty of 1 l.; that all penalties are recoverable under Jervis's Act, and are to be paid towards the local poor-rate.

Doubtless it was the intention of the framers of the Act, that these provisions would suffice for the proposed object, "to extend and *make compulsory* the practice of vaccination." Doubtless it was their expectation, that, with such facilities as were designed for comparing together the register of births and the register of successful vaccinations, all cases of default would be patent to any one interested in discovering them; that either the local registrars, as having one kind of interest in the matter, or the local guardians of the poor, as having another kind of interest, would institute all such legal proceedings as might be necessary; and that these proceedings might be begun, without limitation of time, at any moment during the parental neglect. During the first year of the



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Act's being in operation (the year 1854) it certainly seemed as if those expectations were being fully realised, and as if small-pox would in consequence be thenceforth virtually extinguished in this country. Subsequent years have, however, most lamentably shown that those first great successes of the Act depended on an erroneous estimate, not of its intentions, but of its effectiveness. The illusion has been dispelled. And the truth has now become notorious to all persons interested in the results of the Act, that the Act as it stands cannot work according to the intentions of its framers.\*

It has indeed been shown that a first touch of legal pro-

\* The following extract from a letter which I addressed in 1857 to the President of the then General Board of Health, will show what were the early indications of the above-mentioned failure, and what, in my opinion, were its causes. "The first line of figures gives the average of births and of public vaccinations during the years 1848-52; and you will observe that while the births in England were 568,811, the infantine vaccinations were only 180,960. In 1853 the law was altered. In 1854 you find the infantine vaccinations considerably more than doubled. From 180,960 they had risen to 408,824. And not only this. The indirect action of the law had extended to induce what it could not compel; and vaccinations at ages after the first year of life had likewise been increased by more than 100,000 cases. Thus in 1854, under the immediate influence of the new law, the total public vaccinations of England, at all ages, exceeded by more than 75,000 the total number of births; the large majority of 290,111 cases in the third column, consisting, no doubt, of young children, whose vaccination under the former defective system had been indefinitely delayed.

—	Annual Public Vaccina- tions.		Annual Births.
	Under One Year of Age.	Over One Year of Age.	
Average of the 5 Years 1848-52	180,960	185,139	568,811
1854 -	408,824	290,111	623,699
1855 -	354,979	109,120	623,181
1856 -	350,847	84,165	640,840
1857 (a) -	338,720	84,701	649,963
1858 (a) -	341,790	126,218	654,914
1859 (a) -	335,200	120,149	669,834
1860 (a) -	354,401	140,541	689,060

(a) These numbers for later years are added to the original text, and confirm its argument.—J. S. 1861.

"The Table shows a further important fact. In the line for 1855 and in that for 1856 you will notice again a decline in the number of vaccinations; not alone in the third column (where a decline from 290,111 to 109,120, and again from 109,120 to 84,165, might mean only that the first year of activity had so far cleared off existing arrears in the category as to leave but few non-vaccinated children to appear afterwards) but also in the second column, where a decline from 408,824 to 354,979, and from 354,979 to 350,847 infantine vaccinations can only denote that the *stimulus which was given to early vaccination by the new law in the first year of its working, became in the second year less effective than in the first, and in the third less effective than in the second.*

"The explanation is simple. At the first passing of the law people hastened to obey—because they feared to disobey—its imperative provisions. The possibility of a summons and of a fine was before them. This, which would not have conquered any resolute objection, was just enough to stir that mere indifference which, among uneducated persons, is the main obstacle to universal infantine vaccination. The law commanded *and threatened*; so it must be obeyed. Thus, in the first year. But it was soon discovered that the threat was an empty one; that it could not be fulfilled; that the law had provided no machinery for its execution. And



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ceedings is enough to conquer the mere *vis inertiae* which, infinitely more than any prejudice against vaccination, accounts for so large a part of the infantine population being habitually left unvaccinated. But, owing to the construction of the law, that one touch is in most cases absent. For how are legal proceedings to be paid for? The registrar or public vaccinator, if he summon defaulters, cannot recover his costs. And different local authorities have taken different views as to their own power of paying out of their respective rates either the expenses of such summonses, or the various other small expenses which may be incurred in giving full effect to the law. Doubts also have arisen how to construe, with reference to continuing non-vaccination, that provision of Jervis's Act which forbids proceedings to be taken when more than six months have elapsed from the time of committing an offence. Other questions have been raised as to the distinctive liabilities (in certain cases) of father and mother respectively. And finally, owing to the fact that private practitioners have habitually not transmitted to the registrar such vaccination-certificates as accrue from their practice, it has resulted that the registrar's account of vaccinations is but indirect and insufficient evidence with regard to those points, where, for the working of the Act, it ought, of course, to be entirely conclusive.

It can be no wonder that, under these circumstances, the law is not as operative as their Lordships would wish it to be against the present great epidemic of small-pox. Both during the inquiries which have here been referred to, and during those which are next to be described, complaint has been made almost universally by local authorities and local officers of the difficulties under which they now labour in endeavouring to procure obedience to the law.

## II.—The working of the VACCINATION LAWS, and of the REGULATIONS and ARRANGEMENTS made with regard to them.

### II. Vaccination.

FROM the preceding section of this Report it will have appeared that proceedings which were taken during 1860 with reference to epidemics of small-pox necessarily threw light on the state of vaccination in the inspected districts; and it will

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then forthwith obedience began to decline in the proportion which those figures express.

“In short, it is a radical defect in the Act, considered in its compulsory relations, that the duty of warning defaulters, and the discretionary power of proceeding against them, are assigned to no local officer or local authority, and that, consequently, the compulsory provision of the law rapidly tends to be regarded as a dead letter.”



have been seen that, as a rule, the working of the Vaccination Extension Act of 1853 was found to be most unsatisfactory.

But, apart from present epidemics of small-pox, the working of the vaccination-laws needed to be inquired into. For this purpose, and particularly with regard to the observance of those Regulations which, under the Public Health Act, have been made (by order of Privy Council, dated December 1st, 1859) for the improvement of public vaccination, their Lordships have seen fit, in the past year, to direct the commencement of a *systematic inspection*. The commencement was made in Unions where the amount of infantine vaccinations, in comparison with the number of births, appeared to be specially low; and the instructions, which under their Lordships orders I gave for the conduct of the inquiry, were such as I thought might best serve to elicit the various local explanations of this apparent non-compliance with the law.

First, were the facts really as they appeared? Was it the fact, notwithstanding the law that every child (its health permitting) shall be vaccinated within, at farthest, four months from birth,—was it the fact, that Union after Union could be named where the number of infantine vaccinations did not reach a third of the number of births, sometimes not even a sixth or an eighth?

If so, where was the fault? Did the local arrangements not give such facilities as the law requires to be given to persons willing to have their children vaccinated? Did the local authorities omit to publicly notify these arrangements? Did the local registrar not duly deliver to persons registering births the notice which reminds them of their obligation to have the infant vaccinated? Was the local vaccination-register imperfectly kept, so that the defaults of infantine vaccination could not be readily discovered? Were there, in the local contracts for vaccination, any conditions which would tend to defeat the object of the law? Or, not least, was there in the local style of vaccination, as performed by the contractors, any fault or slovenliness which could create a public prejudice against vaccination?

Such, in substance, were the questions which had to be solved by local inquiry. And, in answer to them, so far as they have yet been answered, I append *in extenso* the report which has been made to me by Dr. Seaton with respect to 152 vaccination districts comprised in the 41 Unions hitherto inspected by him under these instructions. See Appendix, No. IV.

I have already had occasion to report the conclusion, to which the results of this inquiry have largely contributed, that

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the present law—"to extend and make compulsory the practice of vaccination"—is so imperfect, as to be, for its professed objects, almost inoperative. Of course where it appeared, on local investigation, that non-compliance with the law depended simply on the non-compulsiveness of the law, it was impossible to suggest any present mode of conquering the difficulty. But, where it appeared that other causes were at work,—where it appeared that the law, through some defect of plan or execution in the local arrangements for public vaccination, was rendered less operative than it might be, this was pointed out to the local authorities or their officers, and advice was given them how they might best proceed to render their plans and proceedings more conformable to the intentions of the law. It affords me the greatest satisfaction to report, with respect to these communications, that universally the inspection was welcomed as an assistance given by the Privy Council to local authorities in a matter of much difficulty; and that, even where criticism of local proceedings had to be expressed, every willingness was shown to make the suggested amendments.

As regards the observance of those Regulations of the Privy Council, which were established by their Lordships' Order of December 1, 1859, and came into effect on the first day of 1860, for the improvement of public vaccination, it would be premature on this occasion to say more than that the regulations seem to be operating usefully. It was occasionally found that, in consequence of them, very desirable improvements had already been locally made, sometimes in the manner of vaccinating, sometimes otherwise in the discharge of a contractor's duties. It was evident, however, that the observance of the Regulations would be, perhaps for years, comparatively imperfect, unless their adoption were promoted by the kind of inspection here reported on. For, with regard to detailed arrangements and proceedings (which, after all said and done, must necessarily in great part remain affairs of local discretion) the influence of formal printed regulations can never be more than a miserable substitute for local intelligence, education and zeal. And the great advantage of the inspections which are here reported on,—inspections which their Lordships propose to continue systematically through the other Unions of England, is, that by means of them the spirit and intentions of their Lordships' Order are made clear to those who have to carry the Order into effect; that explanations or reasons are given where they are wanted; and that consideration is directed to points which before have been overlooked.

In illustration of my meaning, I cite a single instance.



Among the *Instructions for Vaccinators* is the following direction:—“ In all ordinary vaccinations, vaccinate by four or five separate punctures, so as to produce four or five separate good sized vesicles; or, if you vaccinate otherwise than by separate punctures” [for some vaccinators prefer to make long slight scratches, side by side or intersectingly, instead of punctures] “ take care to produce local effects equal to those just mentioned.” Obedience to this instruction is necessary for conferring on those who are vaccinated the full amount of protection which good vaccination confers. Therefore the inspector was charged always to ascertain whether the direction was obeyed; and, in case of negative finding, he was to bring to the knowledge of the vaccinator certain facts which I have here tabulated. Hereports:—“To

most of the vaccinators the conclusive evidence of the superior value of several vesicles derived from the records of the Small-pox Hospital, was unknown. My communication with them enabling me to lay before them the facts collected by Mr. Marson, which I had had printed in a convenient form, and to explain fully the plan of vaccinating pursued with perfect safety at the large stations of the national establishment, it was a great pleasure to me to find that the result of the free and ample consideration and discussion of these points resulted always in the assurance that the mode

enjoined in the instructions would henceforth be adopted.”

As regards another clause in the above-mentioned *Instructions*, and as regards some urgent recommendations addressed for the same purpose by their Lordships to local authorities, the inspector's report contains valuable information. The instruction I refer to is:—“ Endeavour to maintain in your district such a

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STATISTICAL EVIDENCE of the different degrees in which persons vaccinated in different ways will be safe against Death by Small-pox, if they should happen in after-life to contract this Disease.

The Table is founded on information given to the Medical Officer of the Privy Council by Mr. Marson, Surgeon of the Small-pox Hospital, as the result of observations made during 25 years in nearly 6,000 cases of post-vaccinal small-pox.

Cases of Small-pox, classified according to the Vaccination Marks borne by each Patient respectively.	Number of Deaths per Cent. in each Class respectively.
1. Stated to have been vaccinated, but having no cicatrix -	21 $\frac{3}{4}$
2. Having <i>one</i> vaccine cicatrix *	7 $\frac{1}{2}$
3. Having <i>two</i> vaccine cicatrices †	4 $\frac{1}{8}$
4. Having <i>three</i> vaccine cicatrices	1 $\frac{3}{4}$
5. Having <i>four or more</i> vaccine cicatrices - - - -	$\frac{3}{4}$
Unvaccinated - - - -	35 $\frac{1}{2}$

\* Among cases in which the one cicatrix was *well marked*, the death-rate was 4 $\frac{1}{4}$ . Among cases in which it was *badly marked*, the death-rate was 12.

† Among cases in which the two cicatrices were *well marked*, the death-rate was 2 $\frac{3}{4}$ . Among cases in which they were *badly marked*, it was 7 $\frac{1}{4}$ .



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succession of cases as will enable you uniformly to vaccinate with liquid lymph directly from arm to arm, and do not, under ordinary circumstances, adopt any other method of vaccinating." And the recommendations to which I refer are comprised in a memorandum (given, with explanations, in the last annual report) on "the Sub-division of Vaccinating Stations as affecting the Supply of Lymph." The importance of making such local arrangements as will enable the vaccinator habitually to vaccinate from arm to arm, instead of having recourse to dry lymph, is well illustrated by the following passages of the inspector's report:— "The register of one vaccinator whose common practice it was to use dry lymph, showed 46 failures in 240 vaccinations. Another vaccinator who, during last summer, vaccinated 200 cases, most of them at the people's houses with recent dry lymph on points, but some of them direct from the arm, said that he had had altogether between 20 and 30 failures, not one of which had been in the cases done from the arm; and most vaccinators, without being able to make any numerical statement, spoke of frequent failures with dry lymph. Success, when attained, was in most instances only partial. A vaccinator, whose habit it was to insert lymph by puncture in six places, told me he seldom got more than one or two vesicles; another, operating by abrasion in three places, said he got sometimes three, sometimes two, more often one only; and the testimony was very strong and general that a vesicle could not with confidence be looked for from each puncture or insertion of lymph. . . I met with many illustrations of the paramount importance of so conducting vaccination as to secure, as far as possible, the success of the operation. Of the elder children in schools, whom I have enumerated among the unvaccinated, there were many who assured me they had been cut, and some of them more than once, and that it would not take; and they seemed to be under the impression that it would be of no use vaccinating them any more. Some of the children marked with small-pox in the schools said also they had been vaccinated, 'but it would not take.' Small-pox had been introduced into one village by a child who had been vaccinated three times unsuccessfully. And, on other inquiries, I have met with several cases of death from small-pox in children said to have been vaccinated, but whose vaccination, it appeared on investigation, had not been successful."

Finally, I have to quote from the inspector's report one large set of facts which will show how much remains to be done for the improvement of English vaccination, and how poorly Jenner's countrymen are protected against small-pox, in comparison with that protection which his discovery might confer



on them. The inspector "examined carefully the arms of 12,349 children in various national, parochial and charitable schools, including 397 children in workhouses." The result of this large scrutiny may in round numbers be thus stated:— Of every 12 children examined, 2 would show *no conclusive mark* of having been vaccinated; 3 others would show only such marks as imply *a very imperfect protection* against small-pox; 4 others would have marks which are classed as *passable*; only 3 would be, in the inspector's opinion, *well*, and *very well* protected.

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I have to add, that during the year the educational vaccinating-stations which came into action on the first of January 1860 have been specially inspected. They were found in satisfactory work. A list of them will be found in the Appendix, No. V. 3. And, for particulars relating to their establishment, I refer to my last year's Report.

2. Educational  
Vaccinating-  
stations.

It is not by immediate action of the Privy Council, but by means of a separate Board (that of the National Vaccine Establishment) that the *public supply of vaccine lymph* is maintained and distributed. Yet as, under the Public Health Act, the Privy Council is charged with directing the application of such monies as are for that purpose voted by Parliament, it may be convenient that now, as on former occasions, I should refer to the present state of this important branch of the public sanitary service.

3. Public supply  
of vaccine  
lymph.

In making my first annual report (that relating to the year 1858) I had occasion to regret the then insecure state of the national supply of vaccine lymph; and I described certain new arrangements which were then being commenced, with a view of putting the supply on a more satisfactory footing. Referring to that report for a detailed account of the then existing circumstances, I need at present only state this as its substance;—that, for the maintenance of a supply of vaccine lymph, the public looked to the Board of the National Vaccine Establishment; that this Board depended for lymph exclusively on the vaccinations performed at its own 17 stations in the metropolis; that the number of applicants for vaccination at these stations had been long undergoing a decrease,\* in proportion as successive Acts of the legislature had

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\* See the first of the annexed four tables, particularly the reductions shown after 1840-1 and after 1853. In 1838 the number of vaccinations performed by the establishment amounted to 18,659; during the three years 1850-2, the average annual number was only 10,713; during the three years 1854-6, it had fallen to 8,207; and in 1858 it reached but 6,445. To this reduced number of vaccinations, 17 different stations in the metropolis contributed in unequal proportion: two of them together effecting 3,502 vaccinations, or considerably more than half



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created and developed the parochial system of public vaccination; that, meanwhile the public demands for lymph were increasing;\* and that now the Board could no longer guarantee from its own stations the continuance of sufficient means for satisfying such demands. And the arrangement which in 1858 was proposed in order to obviate the threatened scarcity of lymph was, that the Board should enter into correspondence with certain independent vaccinating-stations (parochial and other) and should with due precaution obtain lymph from these subsidiary sources. This was the state of things reported on in my first annual report.

In the next report (that relating to the year 1859) I was able to show that considerable progress had been made towards developing this better system. Unproductive metropolitan stations of the Vaccine Establishment had been discontinued; and, in proportion to their discontinuance, new sources of contribution had been opened at large provincial towns and at two parochial stations in London.

On the present occasion I am able, with great satisfaction, to report the well-established success of the new arrangements. During 1860 the National Vaccine Board received two-fifths of its lymph-supply from sources thus recently called into existence. The public supply, instead of depending on fewer than 6,500 vaccinations, is now based on nearly 14,000; and we have the advantage of knowing, not only that the new sources could in case of sudden need furnish much more lymph than they now currently supply, but that, on the same plan as that on which they contribute lymph, other parochial stations might at any moment be brought into correspondence with the National Vaccine Board, and be made instrumental in widening more and more the basis of our national lymph-supply.

Three annexed tables show the successive steps of development of our present organization. The first shows the insecure system of 1858, and the small changes which were in that year effected. The second shows the extensive changes of 1859. The third shows the system at present in operation.

of the total; while the remaining 15 contributed various numbers, varying respectively from 72 to 373. At some of these 15 stations vaccination was offered to the public twice, at others, three times a week; but from an analysis of their statistics, it appeared that the average number of cases vaccinated at each of them on each vaccinating day was only about  $1\frac{1}{2}$ .

\* Ordinarily the National Vaccine Establishment was distributing about 215,000 charges of lymph; but under the influence of peculiar circumstances, the demand had risen and might rise again to about 320,000—an amount nearly 60 per cent. higher than was supplied in 1838, when the sources of supply (i.e. the vaccinations performed by the establishment) were nearly three times as numerous as in 1858.



And I conjoin to them a fourth table, which shows in a compendious form the previous statistics of the establishment.\*

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### III.—PLACES with habitually high DEATH-RATES from particular kinds of Disease.

III. High local  
death-rates  
from particular  
kinds of dis-  
ease.

IN the last report which I made to the late General Board of Health,—a report which, as regards its subject-matter, was introductory to the annual reports which I have now the honour of submitting to the Privy Council,—I drew attention to the fact, strikingly displayed in some statistics which Dr. Greenhow had then recently compiled, that *certain diseases, which, among them, make up fully half of our annual mortality, are fatal in widely different degrees in different districts of England.*†

For instance :—while DIARRHOEAL DISEASES had been causing in England annually more than 26,000 deaths, the rate‡ of mortality from these diseases had ranged from 4, 8, 10, 14 and 17 in some districts, to 463, 493, 513, 568 and 663 in others. So again, while FEVER had been killing annually more than 17,000 persons, the death-rate by fever in different districts had ranged from under 50 (already a grievous excess) to more than 200. Similarly with regard to those diseases which are the most common CAUSES OF INFANTINE MORTALITY—diseases which had annually been killing more than 100,000 young children, death-rates had ranged from about 1,300 to about 9,000. Other death-rates, which are among the most important in the register, the death-rates of the adult population by PULMONARY DISEASES had ranged, as regards grown-up men, from 221 and 306 to 1,298 and 1,440. Death-rates by PHTHISIS alone among grown-up women had ranged from 229 to 558.

On the ceasing of the General Board of Health, the above very suggestive facts came under cognisance of the Privy Council. The inference was inevitable, that, to account for

\* See Appendix, No. V. The information contained in these four tables was communicated to their Lordships by the Board of the National Vaccine Establishment.

† See Papers relating to the Sanitary State of the People of England ; being the results of an Inquiry into the different proportions of Death produced by certain Diseases in different Districts in England ; communicated to the General Board of Health by Edward Headlam Greenhow, M.D., with an introductory Report by the Medical Officer of the Board, on the Preventability of certain kinds of premature Death.

‡ The rates are all proportionate to a hypothetical local population of 100,000 living.



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so unequal a distribution of particular kinds of death, there must prevail almost corresponding inequalities in the distribution of causes of disease. And their Lordships, authorised by the Legislature "to cause to be made such inquiries as they see fit in relation to any matters concerning the public health in any place or places," concluded that this apparent localisation of particular morbid influences was quite especially a fit matter for inquiry.

Accordingly, during 1859, inspections were made in what, for brevity, may be termed the DIARRHŒAL DISTRICTS of England. And my last year's report contained a statement of the results which that proceeding elicited.

During 1860 similar inspections have been made with regard to another great class of fatal diseases. The problem of the year has had reference to DISEASES OF THE LUNG:—Why is it, that, in some districts of England, grown-up men or women die from these diseases, or from some of them, three times, four times, even six times, as abundantly as in other districts?

Our large adult mortality from lung-disease is of course very compound in its kind; but two special diseases, between them, make up most of its amount. *Tubercular phthisis* is one of these chief factors; *bronchitis* with its effects is the other. And, with respect to both of these affections, it seemed certain that their great development in particular districts has essentially to do with the industrial relations of the people.

In analysing the statistics of lung-disease, a first great contrast was found to lie between populations, respectively agricultural and manufacturing:—*in proportion as the male and female populations are severally attracted to in-door branches of industry, in such proportion, other things being equal, their respective death-rates by lung-disease increased.* And there are medical reasons, which need not now be detailed, for assuming the augmented "lung-disease" to be PHTHISIS. What is the meaning of this fact?

In the medical mind it at once associates itself with a very important result, which was well developed 17 years ago by the late Dr. Baly, in his admirable essay on the *Diseases of Prisons*. From examination of the medical records of the Millbank Penitentiary, Dr. Baly had learnt "that the mortality caused by tubercular disease had been between three and four times as great during the 18 years, 1825-42, among the convicts confined in this prison, as it was in the year 1842 among persons of the same period of life in London generally; and that three-fourths of the excess of deaths



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“from all causes in the penitentiary above the rate of mor-  
“tality of all persons in the metropolis of the same period of  
“life had been due to the prevalence of that disease.” Compar-  
ing the large number of prisoners in whom tubercular dis-  
ease of the lungs first showed itself while they were in the  
penitentiary with the small number who were affected with it  
at the time of their reception, he was convinced “that im-  
prisonment exerted here a very powerful influence in causing  
the development of the disease.” Extending his inquiry to  
the other prisons of England, and to the persons of other  
States in Europe and America, he found that the influence  
was one of universal operation, and learnt (as might have been  
expected) that other forms of scrofula were developed in the  
same proportion as pulmonary phthisis; that not merely this  
one form of the infliction, but tubercular disease in all its  
forms, resulted from the long-continued influence of imprison-  
ment on the bodily health.\* This influence appears to be  
partly physical and partly moral:—among its component parts  
(with cold and poorness of diet) Dr. Baly enumerates *deficient  
ventilation, sedentary occupations, and want of active bodily  
exercise, and a listless or dejected state of mind.* Of the  
points thus enumerated, there are some in which the life of  
textile factory-populations, and of certain other in-door work-  
people, is comparable to the life of prisoners. Taking, for  
instance, the case of girls and women who from childhood  
onwards sit ten hours a day or more, often in constrained  
postures, weaving or knitting at looms and stocking-frames, or  
plaiting straw, or stitching gloves, or lace-making:—this life,  
at its best, has to a great extent the evils of monotony, of  
deficient bodily exercise, of physical seclusion from sun and  
air, and of mental privation from what is beautiful and  
animating in external nature.† And thus probably, even at

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\* During the years which have elapsed since the publication of Dr. Baly's paper, progress has been made toward removing from prison-life many known causes of scrofulous disease. And as the fever-mortality of Howard's time long ago followed the removal of its causes, so, no doubt, the high tubercular mortality of prisons is at present in course of extinction.

† The Saturday half holiday, if it becomes general, is likely to be of considerable importance in mitigating these evils. And generally speaking it may be said that employers who take an interest in promoting the recreation of their work-people, especially by out-door exercise or in pursuit of natural history, are great sanitary benefactors. The number of such men is now not inconsiderable; and the relations between capital and labour are, doubtless, every year becoming more merciful. From a most interesting paper “on the relations between Employer and Employed under the Factory System,” published in the Transactions of the Social Science Association, I extract the following description of the resources and inducements for recreation which Mr. Akroyd, the author of the paper,



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its best, it tends to produce somewhat of vital depression, somewhat of mental and bodily etiolation, during which, especially with persons otherwise predisposed to scrofula, there is a heightened liability to tubercular disease. Where an industrial system is bad,—bad, either in excessive length of daily work, or in the over-crowdedness and non-ventilation of work-places, these evils may be vastly developed. Their maximum may be expected to prevail in places where an over-tasked population does its work in ill-ventilated factories and cottages.

From these considerations, it would of course not necessarily follow that an excess of phthisis, prevailing in our great centres of manufacture, is, in any practical sense, preventable. But at least there was great encouragement to inquiry. Should it appear that a high development of phthisis among men and women employed in certain manufactures is really an essential appanage of the employment, even when not excessively laboured in, then perhaps might be borne, without fruitless repining, this tax on the industry of our people. But should it, on the contrary, appear that the production of disease in each phthisis-breeding employment depends in great part on sanitary faults which might be eliminated from the employment (on defective ventilation,\* for instance, and other like

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has provided for his nearly 5,000 operatives:—"A library is attached to the works, to which any of the work-people has access free of charge. A news-room is provided, supplied with the newspapers of the metropolis and of the locality, and also with the current periodical literature. A band is established at the works, and its performances are very creditable. It plays out of doors occasionally when the weather is favourable, at other times in a room provided for that purpose. Allotment gardens are provided for the workmen, and in connection therewith a horticultural and floral society has been established to promote the knowledge and cultivation of fruits, flowers, plants and vegetables. An exhibition is held annually, at which prizes are given for the best productions of the respective gardens. To strengthen the habit of observation, and to cherish a taste for the beauties of nature, I give prizes for the best selection of wild plants and ferns growing in the neighbourhood. Recreation grounds are provided for the juvenile and adult members of the establishment, and every encouragement is given to the practice of healthy out-door sports and athletic games."

\* One of the most eminent of French physicians (M. Baudelocque, writing in 1832) described scrofulous diseases as almost exclusively due to particular conditions of the atmosphere in which the patient resides. He asserted, namely, that if the houses are so placed that the sun's rays cannot reach them, nor the fresh air be renewed without difficulty,—if, in short, they are small, low, dark and badly aired,—scrofulous disease will inevitably supervene. And although his opinion, in its extreme form, is not generally received by the medical profession, nearly all writers concur in recognizing the very great degree in which scrofulous manifestations depend on removable causes, and especially on unwholesome conditions of dwelling. Dr. Watson (in the recent edition of his Lectures, vol. i. p. 107) says,—“Scrofula depends in part upon hereditary constitution; it partly arises also from exposure to cold and wet; but there is much reason for believing that impure air is a very powerful agent in calling scrofula into action, and in aggravating the strumous diathesis.” In corroboration of this view, I may cite the very important facts



influences), then at once the way would be opened to an improved economy of life in many chief branches of popular industry. Accordingly, as regards phthisis, these considerations were submitted to their Lordships.

Our statistics of lung-disease had justified a second generalisation. Conspicuous among the suffering districts, stood places which are the chief seats of metal-mining,\* of metal-manufacture, and of pottery-manufacture. And there were medical reasons for presuming that in these places the predominant lung-disease was, at least primarily, BRONCHITIS. For, with reference to this disease, two kinds of occupation have long been recognised as peculiarly hurtful;—first, those which give rise to *mechanical or chemical irritation of the air-passages*, by diffusing in the air of work-places any considerable amount of metallic or earthy grit, or of acrid smoke or vapor, or even of dust or fluff from flax, cotton or wool; secondly, those in which the operatives are exposed to *abrupt changes of temperature*. And it was notorious that, in one or both of these respects, abundant causes of bronchitis might exist in the above-mentioned branches of industry, as also in some textile occupations. Indeed, except where special provision is made against them, such causes could not fail to affect considerable classes of

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elicited in 1857 by the Commissioners appointed to inquire into the sanitary condition of the army. The Commissioners state, that "while in civil life [population of 24 large towns] at the soldier's ages the deaths by pulmonary diseases are "6·3 per 1,000; they amount in the cavalry to 7·3; in the infantry of the line to "10·12; in the Guards to 13·8 per 1,000; and that of the entire number of deaths "from all causes in the army, diseases of the lungs constitute . . . in the cavalry "53·9 per cent.; in the infantry of the line, 57·277 per cent.; in the Guards, "67·683 per cent." They argue, "that in civil life insufficient clothing, insufficient and unwholesome food, sedentary and unwholesome occupations, and the vitiated atmosphere of unhealthy dwellings, all contribute to the propagation of this class of diseases. But in the army it cannot be alleged that the clothing, the food, or the nature of the occupation in itself, are of a character which would justify the imputation that they are among the predisposing causes of the excessive mortality of the soldier by pulmonary disease." And they accordingly conclude, "that the ravages committed in the ranks of the army by pulmonary "disease, are to be traced in a great degree to the vitiated atmosphere generated "by overcrowding and defective ventilation, and the absence of proper sewerage in "barracks; . . . this one cause acting with such intensity, especially when super- "added to a certain amount of exposure, as not only to produce in the Foot Guards "an amount of the disease in question which is greater than is produced in civil "life by all the four causes united, but which actually carries off annually a num- "ber of men in the infantry nearly equalling, and in the Guards actually exceeding, "the number of civilians of the same age who die of all diseases put together."

\* Special reference was made to "the most exclusively lead-mining district in "England" as one, which (though remote from city influences, and situated in the midst of a most salubrious country) had been losing by diseases of the lung, in consequence of its prevalent occupation, a "larger annual proportion of its "adult male inhabitants than the unhealthiest city in the kingdom, and as the "place in which there is a larger proportion of widows than in any other place in "the kingdom."



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operatives; those, for instance, whose breath is drawn amid the metallic spray of a cutler's grinding-wheel, or amid the blast-soot and rock-dust of metal-mining, or amid the products of flax-hackling and cotton-carding, or amid clouds of flinty powder in the pressing and scouring rooms of a pottery; or those, on the other hand, who work in such air as serves to evaporate potters' slip, or beside the stoves where earthenware is dried, or amid the hot-water troughs from which flax is spun, or in the heat of copper-mines, and who, during their work or in leaving it, run all chances of other temperature. To what extent provision is actually made against the dangers referred to, could not without inquiry be exactly stated. Nor could it in the first instance be judged to what extent such evils, where prevailing, could readily be reduced or removed. But meanwhile the case, as it stood, was submitted to their Lordships.

And commonly, with reference to both phthisis and bronchitis, this further conclusive proof was given as to the influence of an accused occupation; viz., that the high death-rate from lung-disease belonged, according to the occupation, to men or to women of the district; that it sometimes was nearly twice as high for the employed sex as for the unemployed sex; and that it only extended to both sexes, where both were engaged in the occupation.

Their Lordships, having considered the above facts in their relation to certain large branches of industry, and having been pleased to accept my opinion that, in order to render those facts applicable to particular cases, more circumstantial evidence must be collected, ordered that, for this purpose, inquiries by an inspector should be made at some of the principal seats of the accused occupations. The places selected for inquiry were the following:—

STOKE-UPON-TRENT and WOLSTANTON, in both which places the population, male and female, is largely employed in the *making of earthenware and china*;

BROMSGROVE, ALCESTER and SHEFFIELD, where the chief occupation, male and female, is *working in iron*;

PENZANCE and REDRUTH, where *tin-mining* and *copper-mining* are the special pursuits of the men, and give also some employment to women;

REETH, where half the adult men are employed in *lead-mining*;

PATELEY BRIDGE, where there is also some lead-mining, but where specially there is work in *flax-factories* for both male and female population;



MACCLESFIELD and LEEK, where the population, both male and female, is largely employed in *silk-working* ;

LEEDS, BRADFORD, STROUD and MELKSHAM, where people of both sexes work specially in *wool-factories* ;

LEICESTER and HINCKLEY, where the *making of hosiery* occupies a large part of the population, both male and female ;

PRESTON, where the principal employment of both sexes is in *cotton-factories* ;

TOWCESTER and NEWPORT PAGNELL, where the female population is largely engaged in *lace-making* ;

BERKHAMPSTEAD, where the female population is largely engaged in *straw-plaiting* ;

YEOVIL, where some of the male, and a large proportion of the female population, are engaged in *glove-making* ;

SAFFRON WALDEN, where the industry is *agricultural*, and where the causes of pulmonary disease are not of an occupational kind.

And the statistical evidence which led to this selection of places is expressed in the adjoining table ; where at a glance may be seen the proportion of mortality from lung-disease in each inspected district as compared with certain suitable standards of health.

The local inquiry was entrusted to Dr. Greenhow, whose valuable statistical compilation, already referred to, had first demonstrated the full importance of the subject. And the instructions, which, under their Lordships' orders, I gave for the inquiry, were to this effect :—

Population in 1851.	Registration Districts.	Death-rates by Pulmonary Diseases, including Phthisis.	
		Males.	Females.
57,942	Stoke-upon-Trent - - -	721	665
41,916	Wolstanton - - -	726	727
24,822	Bromsgrove - - -	583	559
17,482	Alcester - - -	559	577
103,626	Sheffield - - -	839	670
53,517	Penzance - - -	560	456
53,628	Redruth - - -	670	450
6,820	Reeth - - -	724	528
7,579	Pateley Bridge - - -	508	391
63,327	Macclesfield - - -	691	804
23,031	Leek - - -	588	705
101,343	Leeds - - -	817	718
181,964	Bradford - - -	611	603
37,386	Stroud - - -	511	511
18,815	Melksham - - -	626	559
60,642	Leicester - - -	740	659
15,595	Hinckley - - -	652	603
96,545	Preston - - -	776	768
12,806	Towcester - - -	475	573
23,109	Newport Pagnell - - -	490	545
12,527	Berkhampstead - - -	401	566
28,463	Yeovil - - -	528	591
20,716	Saffron Walden - - -	520	612
	As Standards for comparison :—		
56,637	Six Northern Districts -	297	304
71,330	Six Southern Districts -	411	454
183,154	Ten South-Western Districts -	446	395

N.B.—Each death-rate is proportionate to a hypothetical population of 100,000 males, or 100,000 females.

The death-rates are calculated *without distinction of age*. Were they calculated for only the working ages of life, the contrasts would appear much more marked. The contrasts might also be far better shown, if it were possible to give the death-rates of *special operatives* exclusively, instead of giving the death-rates of whole districts.

The death-rates are for the seven years 1848–54, except in regard of the standard districts, where they are for the nine years 1849–54.



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that Dr. Greenhow, visiting the enumerated districts (with a view to ascertain in each of them, as far as possible, what is the present pressure of pulmonary disease on the adult population, and what local circumstances contribute to cause any excess which may be discovered of such disease) should, in each district, particularly inquire of the registrar of deaths as to the degree in which the local death-rate by pulmonary disease is influenced by the deaths of persons engaged in such occupations as are more or less special to the district; that he should also in each district seek to learn from the officers of friendly societies, of medical charities, and of the poor law service, in what amount and with what distribution pulmonary disease habitually exists among the adult local population; that, in any case where much pulmonary disease is found to be concurrent with the pursuit of any particular occupation, he should inquire into the details of the occupation, especially with regard to those influences in it which seem likely to be hurtful to health, and should personally observe the actual state of health of operatives exposed to such influences.

The results of the large inquiry made under these instructions have but quite recently (March 4) reached me. Under their Lordships' orders, I am preparing to collect further information, and to submit remedial suggestions, with reference to the evils reported on. I annex (App. No. VI.) Dr. Greenhow's paper; but, purposing at the first opportunity to report in full on the subject, I now only refer to that paper as a record of the information which has been collected.

*John Simon.*

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## APPENDIX.

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### No. I. GENERAL MEMORANDUM on Proceedings which are advisable in Places attacked or threatened by Epidemic Disease.

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advised with  
regard to  
Epidemics.

1. WHEREVER there is prevalence or threatening of Cholera, Diphtheria, Typhus, or any other epidemic disease, it is of more than common importance that the powers conferred by the Nuisances Removal Acts, and by various other laws for the protection of the Public Health, be well exercised by those in whom they are vested.—  
[*An abstract of the Nuisances Removal and Diseases Prevention Acts is given in the same Circular with this Memorandum.*]

2. If the danger be considerable, it will be expedient that Local Authorities, in taking measures against it, avail themselves of the best medical advice which their district or its neighbourhood can supply.

3. Proper precautions are equally proper for all classes of society. But it is chiefly with regard to the poorer population,—therefore chiefly in the courts and alleys of towns, and at the labourers' cottages of country-districts, that Local Authorities are called upon to exercise vigilance, and to proffer information and advice. Common lodging-houses, and houses which are sub-let in several small holdings, always require particular attention.

4. Wherever there is accumulation, stink, or soakage, of house-refuse, or of other decaying animal or vegetable matter, the nuisance should as promptly as possible be abated, and precaution should be taken not to let it recur. Especially all complaints which refer to sewers and drains, or to foul ditches and ponding of drainage, or to neglect of scavenging, should receive immediate attention. The trapping of house-drains and sinks, and the state of cesspools and middens, should be carefully seen to. In slaughter-houses, and other places where beasts are kept, strict cleanliness should be enforced.

5. In order to guard against the harm which sometimes arises from disturbing heaps of offensive matter, it is often necessary to combine the use of chemical disinfectants with such means as are taken for the removal of filth; and in cases where removal is for the time impossible or inexpedient, the filth should always be disinfected. Disinfection is likewise desirable for unpaved earth close to dwellings, if it be sodden with slops and filth. Generally, where cholera or typhoid fever is in a house, the privy requires to be disinfected.—  
[*For an account of processes of disinfection, see below.*]

6. Sources of water-supply should be well examined. Those of them which are in any way tainted by animal or vegetable refuse,—above all, those into which there is any leakage or filtration from sewers, drains, cesspools, or foul ditches, ought no longer to be drunk from. Especially where the disease is cholera, diarrhoea, or typhoid fever, it is essential that no foul water be drunk.

7. The washing and lime-whiting of uncleanly premises, especially of such as are densely occupied, should be pressed with all practicable despatch.



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8. Overcrowding should be prevented. Especially where disease has begun, the sick room should, as far as possible, be free from persons who are not of use or comfort to the patient.

9. Ample ventilation should be enforced. It should be seen that window frames are made to open, and that windows are sufficiently opened. Especially where any kind of infective fever has begun, it is essential, both for patients and for persons who are about them, that the sick-room and the sick-house be constantly well traversed by streams of fresh air.

10. The cleanliest domestic habits should be enjoined. Refuse-matters which have to be cast away should never be let linger within doors. And things which have to be disinfected or cleansed should always be disinfected or cleansed without delay.

11. Special precautions of cleanliness and disinfection are necessary with regard to infective matters discharged from the bodies of the sick. Among discharges which it is proper to treat as infective, are those which come, in cases of small-pox, from the affected skin; in cases of cholera and typhoid fever, from the intestinal canal; in cases of diphtheria, from the nose and throat; likewise, in cases of any eruptive fever, the general exhalations of the sick. The caution which is necessary with regard to such matters must of course extend to whatever is imbued with them; so that bedding, clothing, towels and other articles, which have been in use by the sick, do not become sources of mischief, either in the house to which they belong, or in houses to which they are conveyed. Moreover, in typhoid fever and cholera, the evacuations should be regarded as capable of communicating an infectious quality to any night-soil with which they are mingled in privies, drains, or cesspools; and this danger is best guarded against by disinfecting them before they are thrown away:—above all, they must never be cast where they can run or soak into sources of drinking water.—[*For an account of processes of disinfection, see below.*]

12. All reasonable care should be taken not to spread infective disease by the unnecessary association of sick with healthy persons. This care is requisite, not only with regard to the sick-house, but likewise with regard to day-schools and other establishments wherein members of many different households are accustomed to meet.

13. Where dangerous conditions of residence cannot be promptly remedied, it will be best that the inmates, while unattacked by disease, remove to some safer lodging. If disease begins in houses where the sick person cannot be rightly circumstanced and tended, medical advice should be taken as to the propriety of removing him to an infirmary or hospital. In extreme cases, special infirmaries may become necessary for the sick, or special houses of refuge for the endangered.

14. Privation, as predisposing to disease, may require special measures of relief.

15. In certain cases, special medical arrangements are necessary. For instance,—as cholera in this country almost always begins somewhat gradually in the comparatively tractable form of what is called “premonitory diarrhoea,” it is essential that, where cholera is epidemic, arrangements should be made for affording medical relief



without delay to persons attacked even slightly with looseness of bowels. So, again, where small-pox is the prevailing disease, it is essential that all unvaccinated persons (unless they previously have had small-pox) should very promptly be vaccinated; and re-vaccination should also be offered, both to persons above puberty who have not been vaccinated since childhood, and to younger persons whose marks of vaccination are unsatisfactory.

16. It is always to be desired that the people should, as far as possible, know what real precautions they can take against the disease which threatens them, what vigilance is needful with regard to its early symptoms, and what (if any) special arrangements have been made for giving medical assistance within the district. Especially in case of small-pox or of cholera, such information ought to be spread abroad by printed hand-bills or placards. In any case where danger is great, house-to-house visitation by discreet and competent persons may be of the utmost service, both in quieting unreasonable alarm, and in leading or assisting the less educated and the destitute parts of the population to do what is needful for safety.

17. The present Memorandum relates to occasions of emergency. Therefore the measures suggested in it are all of an extemporaneous kind; and permanent provisions for securing the Public Health have not been in express terms insisted on. It is to be remembered, however, that, in proportion as a district is habitually well cared for by its Sanitary Authorities, the more formidable emergencies of epidemic disease are not likely to arise in it.

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#### PROCESSES OF DISINFECTION.

*N.B.—Artificial disinfectants cannot supply the place of cleanliness, ventilation and drainage. Their use is for exceptional purposes. The great natural disinfectant is fresh air, abundantly and uninterruptedly supplied.*

#### RECOMMENDATIONS by Professor Miller.

1. For purposes of artificial disinfection, the agents which most commonly prove useful are—chloride of lime, quick-lime, and Condry's manganic compounds. Metallic salts—especially perchloride of iron, sulphate of iron, and chloride of zinc, are, under some circumstances, applicable. In certain cases, chlorine gas or sulphurous acid gas may advantageously be used; and, in certain other cases, powdered charcoal or fresh earth.

2. If perchloride of iron or chloride of zinc be used, the common concentrated solution may be diluted with eight or ten times its bulk of water. Sulphate of iron or chloride of lime may be used in the proportion of a pound to a gallon of water, taking care that the water completely dissolves the sulphate of iron, or has the chloride of lime thoroughly mixed with it. Condry's stronger fluid (red) may be diluted with 50 times its bulk of water: his weaker fluid (green) with 30 times its bulk of water. Where the matters requiring to be dis-



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infected are matters having an offensive smell, the disinfectant should be used till this smell has entirely ceased.

3. In the *ordinary emptying of privies or cesspools*, use may be made of perchloride of iron, of chloride of zinc, or of sulphate of iron. But, where disease is present, it is best to use chloride of lime, or Condry's fluid. Where it is desirable to disinfect, before throwing away, the evacuations from the bowels of persons suffering from certain diseases, the disinfectant should be put into the night-stool or bed-pan when about to be used by the patient.

4. *Heaps of manure* or of other *filth*, if it be impossible or inexpedient to remove them, should be covered, to the depth of two or three inches, with a layer of freshly burnt vegetable charcoal in powder. Freshly burnt lime may be used in the same way, but is less effectual than charcoal. If neither charcoal nor lime be at hand, the filth should be covered with a layer, some inches thick, of clean dry earth.

5. *Earth, near dwellings*, if it has become offensive or foul by the soakage of decaying animal or vegetable matter, should be treated on the same plan.

6. *Drains and ditches* are best treated with chloride of lime, or with Condry's fluid, or with perchloride of iron. A pound of good chloride of lime will generally well suffice to disinfect 1,000 gallons of running sewage; but of course the quantity of disinfectant required will depend upon the amount of filth in the fluid to be disinfected.

7. *Linen and washing apparel* requiring to be disinfected, should, without delay, be set to soak in water containing, per gallon, about an ounce either of chloride of lime, or of Condry's red fluid. The latter, as not being corrosive, is preferable. Or the articles in question may be plunged at once into boiling water, and afterwards, when at wash, be actually boiled in the washing-water.

8. *Woollens, Bedding, or Clothing*, which cannot be washed, may be disinfected by exposure for two or more hours, in chambers constructed for the purpose, to a temperature of F. 210°—250°.

9. For the disinfection of *interiors of houses*, the ceilings and walls should be whitewashed with quick-lime. The wood-work should be well cleansed with soap and water, and subsequently washed with a solution of chloride of lime, about two ounces to the gallon.

10. *A room, no longer occupied*, may be disinfected by sulphurous acid gas, or chlorine gas:—the first, by burning in the room an ounce or two of flowers of sulphur, in a pipkin; the second, by setting in the room a dish, containing a quarter of a pound of finely powdered black oxide of manganese, over which is poured half a pint of muriatic acid previously mixed with a quarter of a pint of water. In either case the doors, chimney, and windows of the room must be kept carefully closed during the process, which lasts for several hours.



No. II. Mr. AUSTIN'S Report on the Water-supply and Drainage  
of *Bedford*.

Appendix.

II. Water-  
supply and  
Drainage of  
*Bedford*.

THE population of Bedford now numbers between 13,000 and 14,000, the town having doubled itself within the last 30 years. The town lies, for the most part, on a flat, the surface having a slight declivity only towards the River Ouse, which passes through the town, and divides it into two unequal parts.

The subsoil of the town, generally, is gravel for a depth of 8 or 10 feet, resting on the limestone rock.

There are said to be some deep wells in the town; but the general supply of water for the inhabitants is derived from shallow wells sunk into this gravel only. The water stands in these wells, for the most part, within 4 to 6 feet of the surface.

The level of the river as it passes through Bedford is raised about 4 feet above its original or natural height, by a weir, and no doubt the land-water in the porous gravel subsoil on which the town stands is thereby penned up higher than it would be if it had its natural outlet.

The drainage of Bedford is most defective. The principal outfall for discharge of the sewage into the river is above the town, and in summer-time this outfall is said to be most offensive. There are two main sewers, of three feet diameter. The other sewers are described as chiefly built with bricks laid flat in the lower part and without any mortar. In some cases the sewers are at such little depth, that cellars of houses are accustomed to receive the foul liquid which filters through these defective constructions.

House drainage is not general. That which does exist is formed, for the most part, of wretchedly constructed square brick drains. The more recent house drains have been formed of 6-inch agricultural pipes, with butt-joints, which in such a subsoil as this would also be a very objectionable mode of drainage.

There are very few water-closets in the town, but they are on the increase. Cess-pools are almost universal: there are said to be upwards of 3,000 of them. The usual course is to construct these cess-pools so that the liquid should soak away from them as rapidly as possible into the surrounding soil. In fact the builders have no alternative, for the Local Act of Bedford forbids the drainage of any cess-pool matter into the sewers.

The wells from which the inhabitants derive their supply of water for drinking and other purposes are frequently in close proximity with those cess-pools.

Almost the entire system of sewers, drains and cesspools in this town is one of percolation and saturation of the subsoil, and it is almost impossible, with the liquid refuse of 13,000 people constantly passing into such a limited body of water as would be upheld in these few feet depth of gravel, that any portion of the supply could escape more or less pollution. Well aerated, cool and sparkling as the water from the gravel usually is, that pollution may frequently escape detection, but it can scarcely fail to exist throughout the whole of the more thickly populated part of the town.

A striking example of the distance to which foul matter will



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travel through this porous subsoil came under my notice. The water from some wells, situated at a distance of 500 feet from the gas-works, was so impregnated with soakage from the gas-tar refuse on these premises as to be most offensive, and quite unusable for any purpose. The flavour and smell of gas-tar are not readily got rid of, and are easily recognized; it is frequently otherwise with the more dangerous pollution from cess-pools, and chemists agree that injurious matters in solution in the liquid of cesspools are not removed by filtration through gravel, however bright and free from offence to the senses the water may become.

I do not conceive that the evil from which the town suffers is in any way dependent on the damming up of the river, or is even aggravated by it; on the contrary, I am more inclined to think that the lowering of the water of the river would, if any thing, increase the danger, as the saturation would then take place in a less body of water. The water in the wells of the town is not derived from the river; it is land-water on its passage to the river. True, there is free communication, and the land-water is ponded back to a corresponding level with the river; if the river were lowered, the well-water would be lowered, but the soakage from the cess-pools and drains would go on just the same into the lower level to which the water would be reduced. While the damming up of the river causes no inconvenience, it gives the advantage of a more equal body of water through the town, and thus prevents the exposure of a large portion of the river-bed during the droughts of summer. It forms no impediment to a proper system of drainage, as the outfall should be carried out of the town, and below the dam of the river.

With respect to the remedy which would be most applicable to the removal of the very serious evil complained of, I beg to state that, in my opinion, nothing short of a new and complete system of drainage and water-supply will effect the object. These two works must be carried out before the town can possibly be brought into a proper state, and there would be no difficulty whatever in their execution. No partial works of new main lines of sewers and improved outfalls would be of service; every defective subsidiary sewer and every porous drain and cess-pool should be entirely abolished. Nor would it be sufficient merely to execute new works of drainage: even if they were complete, and the escape of foul matter entirely prevented, a very long period must elapse before pure water could be generally drawn from a soil so saturated. Moreover, no system of drainage could be satisfactorily worked in so flat a district without a much more abundant supply of water than would be obtained from these shallow wells.

The importance of these new works was pointed out in a report on an inquiry into the condition of Bedford under the General Board of Health upwards of five years ago. The strongest evidence was then given by medical men of the serious effects of the horrible condition of many parts of the town. The same polluted water then referred to is still in general use, and little or nothing of a judicious character has been done in the way of drainage.

A sanitary committee has, I understand, compelled the execution of private drainage in some cases; but this is only attacking the evil



at the wrong end. While these porous sewers exist, it is doubtful whether more harm than good would not be done by thus extending the percolation of the foul matter. There has been ample experience elsewhere of the most ruinous consequences from the general diffusion of sewage through defective drains into a porous subsoil.

Sooner or later the same catastrophe may be expected in Bedford: the danger is daily increasing: the use of water-closets extends: the population becomes greater. The evils and their remedy were strongly pointed out long ago, and it does seem extraordinary that the governing bodies, with the responsibility which rests upon them, should have been satisfied, notwithstanding, to leave the work undone, to allow the high rate of mortality again complained of to continue, and the welfare and prosperity of the town, and of the important educational establishments it contains, to remain in constant danger.

Appendix.

II. Water-supply and Drainage of Bedford.

No. III. DR. SEATON'S Report of Inspections in certain Metropolitan Unions and Parishes during the epidemic prevalence of Small-pox.

III. Epidemic Small-pox in London.

I BEG to lay before you my concluding report of the steps taken in accordance with instructions given me (December 23, 1859), to inquire into the state of vaccination in the parishes and unions situated in the northern, central and west-central portions of London,\* and to communicate with the local authorities with regard to such steps as might be required for arresting the further spread in those districts of the fatal epidemic of small-pox then prevalent in the metropolis.

I. *The Epidemic, and the Steps taken with regard to it, in the inspected Districts.*

This epidemic had originated more than a year previously, viz., in November 1858. For two years preceding that date London had been more free from small-pox than had ever before been known. From Michaelmas 1856 to Michaelmas 1858 the total registered deaths from this cause had been 357, or an average of not quite  $3\frac{1}{2}$  per week. The average mortality of the six weeks ending November 6th, 1858, was 3; but in the succeeding week the deaths rose suddenly to 15, and from that date they continued at a rate which showed incontestably that a new epidemic period had set in. This sudden rise of *mortality* in the middle of November enables us to fix the outbreak of *the disease* at the commencement of that month.

Origin of the epidemic.

From November 15th to the end of the year the average weekly number of deaths was 12; but, with the exception of Pancras and Islington in the north, the increased mortality was confined to some

Progress in the different districts of London;

\* The 17 unions or parishes were—Paddington, Kensington, Fulham, Chelsea, St. George Hanover-square, Westminster, St. Martin's-in-the-Fields, St. James' Westminster, Marylebone, Hampstead, Pancras, Islington, Hackney, St. Giles', Strand, Holborn, and Clerkenwell.



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London.

of the eastern, southern, and central unions, being observed chiefly in Shoreditch and Poplar in the east, and Camberwell in the south. In the succeeding quarter, while the disease had been checked in Pancras and Islington, and had made little progress in the south, epidemic influence was manifested in every one of the eastern unions, though most conspicuously in Shoreditch and Bethnal Green; and in the east-central it was observed particularly in the parish of St. Luke.

Its progress in the different districts of London is shown in the following Table :

DEATHS Registered from Small-pox.	District, and Population in 1851.					
	Western,	( <sup>a</sup> ) Northern,	West Central,	East Central,	Eastern,	Southern,
	376,427.	490,396.	210,030.	183,226.	485,522.	616,635.
Quarterly Average from Michaelmas 1856 to Michaelmas 1858 - - - - }	5	9½	4	6	6½	7
Quarter ending 31 Dec. 1858	3	18	8	14	35	19
„ 31 March 1859	8	11	11	32	83	29
„ 30 June 1859	13	20	5	14	96	57
„ 30 Sept. 1859	20	20	8	47	91	73
„ 31 Dec. 1859	46	42	29	44	86	120
„ 31 Mar. 1860	45	63	35	43	65	158
„ 30 June 1860	31	16	11	18	43	87
„ 30 Sept. 1860	20	13	3	9	19	18

(<sup>a</sup>) Exclusive of deaths which occurred in Small-pox Hospital.

Thus, during the first three quarters of 1859, while the force of the epidemic was strongly and very fatally felt over the eastern, southern and east-central districts, it was comparatively little manifested in the other portions of London; although these suffered, as they could not fail to do, from their contiguity to highly infected localities, and although in some of the unions there had been outbreaks of a limited character. But, during the last quarter of the year, the power of the epidemic became more widely diffused, and was sensibly felt, as will be seen by the subjoined Table, in most of the western, northern and west-central unions: affecting chiefly Paddington and Westminster in the west; Marylebone, Pancras, and Islington in the north; and St. Giles in the centre.

And extension  
(towards end of  
1859) to the  
Northern,  
Western, &c.  
Unions.

Small-pox Deaths in 1859.		Paddington.	Kensington.	Fulham.	Chelsea.	St. George's, Hanover-square.	Westminster.	St. Martin's.	St. James', Westminster.	Marylebone.	Hampstead.	Pancras.	Islington.	Hackney.	St. Giles'.	Strand.	Holborn.	Clerkenwell.
1st Quarter	- -	1	1	-	-	1	5	-	-	4	-	5	1	1	2	3	3	3
2d Quarter	- -	1	4	-	-	1	5	1	1	4	2	10	3	1	3	2	-	-
3d Quarter	- -	8	3	1	-	1	5	-	2	3	-	7	8	2	4	2	1	1
4th Quarter	- -	14	2	2	2	5	20	-	1	13	1	15	11	2	14	8	2	5



And the progress the disease had made, and the length of time it had endured in the other parts of London, where, after a 12 months' sojourn, it was not yet by any means on the decline, led to the belief that, unless the protection (by vaccination) of the districts to which it had now extended were already very complete, or were speedily made so, it would localize itself in them, as it had done in the other portions of the metropolis, and that a very serious amount of preventable death would in consequence ensue.\* Under these circumstances, my instructions were given to me.

The first step taken in respect to each union, was to communicate with the medical officer of health, and to ascertain from him particularly the condition of the union as to small-pox and vaccination, and the measures which had already been adopted regarding them. I found that the subject had fully engaged the attention of most of these officers, and that in many instances important steps had been taken under their direction.

Reserving the detail of these measures for the particular statement in regard to each union which will be appended† to this report, I may state here in general terms that the authorities of Paddington, Marylebone, St. Pancras, St. George's Hanover Square, St. Giles', St. Martin's-in-the-Fields, and Islington, had resolved, and made public their resolution, to put the powers of the Vaccination Extension Act in force against any persons who should wilfully refuse to have their children vaccinated; that they had, most of them, designated special officers who should lay the complaint of such neglect before the police courts; and that in several of the unions means were taken to ascertain particular instances of neglect by the sanitary inspectors, or inspectors of nuisances. In some of the unions, where no such resolution had been adopted, notices having reference to the existence of small-pox, or the ordinary form of notice requiring vaccination, had been put forth.‡ And one or two of the medical officers of health had prepared, and distributed, or was distributing, short bills of caution and advice in reference to the epidemic. In the In-Wards of St. George's, Hanover-square, in consequence of alarm the preceding summer, the state of the parochial and charitable schools as to vaccination had been inquired into. In the unions of Hampstead, Chelsea, Kensington, Clerkenwell, and Westminster, no public notices had been issued, nor other step taken. But, in the three former, the influence of the epidemic had not been felt; in Clerkenwell, it had manifested itself only in December; in Westminster, the disease had been long present and made considerable progress.

The general effect of the measures adopted had been, of course, to increase the amount of vaccination, but by no means to the extent which might have been anticipated, as will be seen by comparing the public returns for the year ending Michaelmas 1859 with those of the year preceding.

## Appendix.

### III. Epidemic Small-pox in London.

Inquiry into state of vaccination in these unions determined on.

Preliminary communication with the medical officers of health as to steps already taken in each union;

Their influence on public vaccination;

\* The last epidemic of small-pox with which London had been visited, was of two years and three quarters duration; the present epidemic, when these steps were resolved on, had only lasted 14 months.

† I have not thought it necessary to include this Appendix in the present collection of papers. J. S.

‡ In some of the unions these notices had been issued quite early in the spring or summer, and had not been renewed.



Appendix.  
III. Epidemic  
Small-pox in  
London.

UNION.	Public Vaccinations in the Year ending Michaelmas					
	1858.			1859.		
	Under 1.	Over 1.	TOTAL.	Under 1.	Over 1.	TOTAL.
Paddington -	782	91	873	832	197	1,029
Kensington -	630	63	693	767	139	906
Fulham -	535	110	645	591	75	666
Chelsea -	1,035	148	1,183	977	134	1,111
St. George's	918	41	959	943	124	1,067
Westminster	1,063	77	1,140	1,400	226	1,626
St. Martin's -	364	15	379	378	31	409
St. James' -	389	32	421	298	51	349
Marylebone -	1,772	177	1,949	1,862	366	2,228
Hampstead -	104	25	129	101	36	137
Pancras -	2,821	540	3,361	3,208	481	3,689
Islington -	1,804	594	2,398	1,955	491	2,446
Hackney -	1,018	178	1,196	1,322	439	1,761
St. Giles' -	578	147	725	632	163	795
Strand -	859	87	946	921	208	1,129
Holborn -	607	50	657	754	145	899
Clerkenwell -	1,081	53	1,134	969	95	1,064
TOTAL - -	16,360	2,428	18,788	17,910	3,401	21,311

And the present  
condition as to  
vaccination of  
each union.

Recommendations given to  
Boards of  
Guardians ;

The medical officers of health had no reason to believe that there had been any increase in the ratio of vaccinations since Michaelmas, and, with scarcely an exception, they were satisfied that the number of children remaining unvaccinated was very considerable.\* To procure the speedy protection of these children, they thought that measures of a far more decisive kind than had hitherto been adopted were required, and that these ought to be undertaken simultaneously by the respective unions. Hence I received their hearty co-operation in carrying out the plan which had previously been the subject of deliberation with you, and which formed part of my instructions.

My next step, therefore, was to wait upon each Board of Guardians, generally in company with the medical officer of health, and to propose to them as follows:—(1), to issue public notices, which should inform parents and guardians of children very clearly of the risk run by any delay in the vaccination of their children, as well as remind them of the legal penalty incurred by neglect—a penalty which many Boards had determined to enforce; (2), to ascertain and deal with individual cases of neglect, (a) by systematic examination of the children and inmates of the public schools, orphanages, homes, refuges, &c. of each parish, and (b) by inquiries instituted on the vaccination registers; (3) to provide for visitations from house to house,

\* I found the district medical officers (most of whom are also public vaccinators) very strongly of the same opinion, which was entirely justified by the result.



wherever, notwithstanding these precautions, small-pox made its appearance.

These suggestions were at once taken into consideration, and measures founded on them were adopted in every union by the authorities. Notices (for the most part in a form which had been submitted along with the suggestions) were issued by all the Boards, and in each union the medical officer of health either personally inspected, or directed the inspection of, the children in the national, parochial, and other charitable schools. The inquiries on the vaccination register and the house to house visitation were more partially adopted.

The effect of these active measures on vaccination, and consequently on the small-pox mortality, was very speedily marked, and to a certain extent it was possible to form some estimate of the value of each of the recommendations.

1. For example, the value of the warning so immediately and emphatically given by public notice throughout the unions was clearly manifested before there was time for the other measures recommended to produce any notable effect, and in many instances before any of them were commenced. In several districts, as soon as these notices were issued, the houses of the large public vaccinators were fairly besieged by applicants for vaccination, and many of them found their weekly average of primary vaccinations suddenly rise to triple and quadruple its usual amount. Families of unvaccinated children were brought up for protection, and very many adults received the benefit of vaccination for the first time; very many also, doubtful of the sufficiency of the vaccination they had received, were made sure by re-vaccination.

2 (a). Through a skilled examination of children in schools, orphanages, and other like establishments, it was intended, first, to detect cases of neglect, and to bring a weighty amount of influence, independent of legal coercion, to bear for their correction; and, secondly, to secure the full protection of those who, though nominally they had been vaccinated, were really unprotected, or very partially protected, against small-pox. The extent to which this examination was carried varied in the different unions; but it was carried to a large extent in all of them, and in the great majority was effected in a very complete manner indeed by the medical officers of health, with a zeal and assiduity of which I cannot too highly express my admiration. Forty thousand children were examined in a very short space of time (compared with the magnitude of the work and the number of the workers), with the result that between three and four thousand were found unvaccinated, and speedily protected, and that an indefinite but very large number more were found insufficiently protected, of whom many were made safe by re-vaccination. Indirectly, also, this examination procured the vaccination of many children who, being absent from school at the time, were not inspected by the medical officer; and, by the knowledge it spread of the active steps which were a-foot for the detection of neglect, of other children who were not attendants at school at all.\*

Appendix.

III. Epidemic Small-pox in London.

And generally adopted,

With marked effect.

1. Issue of Public Notices.

2 (a). Examination of children in schools, orphanages, &c.

\* Several of the public vaccinators mentioned to me that children belonging to the same families with the school children, but not attending the school, were brought for vaccination with them.



## Appendix.

III. Epidemic  
Small-pox in  
London.2 (b). Inquiries  
on the vacci-  
nation registers.

2 (b). The inquiry on the "Register of Successful Vaccinations" was for the purpose of detecting neglect where the children were too young for school attendance, and of bringing influence to bear directly on the parents, by serving on them notices warning them of the penalty they had incurred. For this purpose, the Boards were recommended to procure from the registrars lists of the children born in the preceding twelve months, who were more than three months old, but whose successful vaccination had not been registered; and to appoint vaccination inspectors to make the necessary inquiries on these lists, in such way as they should be directed by the medical officer of health, from house to house, and, in cases in which it was ascertained that vaccination had not been performed, to serve the prescribed notice. Inquiry of this kind, to a very limited extent, was already in progress, through the ordinary sanitary inspector, or inspector of nuisances, in Paddington and Marylebone. The Boards of Pancras and Islington, acting under powers conferred by local Acts, at once adopted the recommendations, obtained the necessary lists, and appointed inspectors. The voluntary offer of the district medical officers to inquire from house to house obviated the necessity of either obtaining lists or appointing inspectors in Fulham; and in Hackney the medical officers undertook to make whatever inquiries might be called for on any lists which should be obtained. In St. Giles', the rapid progress of the disease, rendering steps of a far more direct kind requisite, superseded the necessity of pressing this recommendation. In other Boards, the question arose of power to pay out of the rates either for the lists or for an inspector; and it was becoming a matter of consideration what course should be pursued, when the effect of the measures already taken and in progress became so manifest, that it was not conceived necessary at the time further to press the question. Where these inspections were carried out, many instances of neglect were brought to light. One-tenth part of the infants on whom this inquiry (in about 4,000 houses) was instituted, in Pancras, were found unvaccinated, being past the legal age, and without legal excuse. In these cases, says Dr. Hillier, "notices were served on the parents requiring them to get the operation at once performed. These notices have been in nearly every case successful."\*

3. Visitation of  
infected locali-  
ties.

3. And whenever small-pox should appear in a locality not before infected, it was recommended that the district medical officer (if the case occurred in his practice) should at once give notice to the medical officer of health, in order that a proper visitation of the locality might be made, and such measures of vaccination and re-vaccination adopted as he might see fit to recommend. Whenever this suggestion was carried out, as was the case in very many instances, the results were always of the most satisfactory kind. And, often, the object proposed was attained in a more direct way, when the district medical officer, being also (as is generally the case) public vaccinator, went himself through the court or locality in which the

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\* In other unions, wherever the form of notice was used, it was always, or nearly always with the same result: *e. g.* in Paddington, Dr. Sanderson states that 234 notices served were complied with in every case, except 4. In two of these, the children had been attacked shortly after the service of the notice with inflammation of the lungs, and died; in the other two, small-pox was contracted a few weeks afterwards, and proved fatal to one of the children.



case of small-pox had occurred. In one or other of these ways, many of the courts about Drury-lane and Clare Market, and some of the densest and worst localities in London, were visited from house to house. In Bennett-court, a case of small-pox occurred in an unvaccinated child in a house where there were five others unvaccinated: thirty children were found in the court requiring vaccination, of whom 16 had never been vaccinated before: they were at once vaccinated, and the disease stopped. In Feathers-court, Holly-street, Vere-street, &c., the same measures were carried out with the same result. And, in like way, some of the worst localities in Pancras, Islington, Clerkenwell, &c., were visited, and extensive measures of precaution adopted. In Islington, Dr. Ballard was allowed the services of a qualified medical man as vaccinating inspector, whom he was able at once to send through a locality which was discovered to be infected. Considerable difficulty, however, occurred in *discovering* infected localities: for in many cases, even of the severe form of the disease, no medical assistance was sought till the case was far advanced, sometimes not till a death certificate was likely to be required; and in other cases, which were medically attended, no intimation of the occurrence of the disease reached the medical officer of health. So it happened that unvaccinated children were found very frequently in houses contiguous to infected houses, and sometimes in the very infected houses themselves, some time after the outbreak of the disease.\*

When the foregoing measures had been recommended to the respective Boards, and more or less completely adopted by them, I inquired from day to day as to their effect, constantly communicating with the medical officer of health and with the public vaccinators, from all of whom I received the most obliging information and assistance. And while I was quite prepared, if the necessity had arisen, to recommend to the Boards more active and complete measures of house visitation, the general result of the steps taken was in most instances so satisfactory, that in two unions only did such a proceeding appear to me to be called for.

1. In the district of South St. Giles', soon after this inquiry commenced, the small-pox mortality increased at such a rate, as showed the full force of epidemic influence. The deaths, which in the quarter ending September 1859, had been but two, amounted in the succeeding quarter to 13, and in the first two weeks of January to 6: inquiries of the registrar showed, that, besides these deaths, three others had been registered as occurring before the 15th January: and it was ascertained by the medical officer of health and his sanitary inspector that many unvaccinated persons were suffering at that time from the disease, and that in these infected localities, often in the very infected houses, there were, notwithstanding the activity with which, since the commencement of the year, vaccination had been carried on, unvaccinated persons and children. The disease

## Appendix.

III. Epidemic  
Small-pox in  
London.Special recom-  
mendations  
given :

## 1. In St. Giles'.

\* Several of the officers of health addressed a circular to all the medical practitioners of their respective unions, specially requesting information of any outbreak of the disease; and thus some cases were brought to their knowledge, but in many instances the request was disregarded. Many small-pox cases also fell under the medical care of dispensaries, &c., the medical officers of which sometimes took great pains about vaccination, and gave early notice of the outbreak; but in other cases it was not so.



## Appendix.

III. Epidemic  
Small-pox in  
London.

## 1. In St. Giles'.

was so evidently gaining power, and was so thoroughly in-rooted in many localities, that Dr. Buchanan and I were quite satisfied the ordinary means of repression would be found inadequate, and that a thorough visitation of the infected spots was imperatively required. Strong representations made on this point to the chairman of the directors of the poor, and other members of the Board, led to the determination that this should be done in the most complete manner, "from house to house, room to room, and child to child;" the parish being quite prepared, as stated by the vestry clerk, to put on any amount of force which might be required for attaining this necessary object. Messrs. Bennett and Knaggs, the medical officers and public vaccinators of the parish, undertook this work; and so completely and with such energy was it carried out, that in a few days all the worst localities had been thoroughly visited, and the vaccinations, which in the fortnight ending January 4 had been 61, and in the succeeding fortnight 143, rose during the next fortnight—the period of this visitation—to 472: 169 of the entire number operated on in January being wholly unprotected, yet living in, or closely contiguous to, the most infected spots. And from the time this step was taken to the end of the epidemic in London in September, (if we except the cases which were known when it was begun, or were ascertained in its progress, to be already suffering from the disease) the deaths from small-pox in the whole of South St. Giles' were but three, only one of which was in parochial practice, and this did not occur till four months afterwards. Now that this result was wholly due to the measures employed, and not to the sudden cessation of epidemic influence, there was the most conclusive proof: for the number of modified cases of small-pox in vaccinated individuals continued as great for many weeks after this extensive vaccination as before; the number of fresh cases of this class admitted in parochial practice from December 21 to January 21 being 28, and from January 21 to February 21, 29. I am much indebted to Mr. Bennett for the kindness with which he furnished me with a complete copy of his small-pox register, an abstract of which, for the half year during which the epidemic prevailed in South St. Giles' (from October 1859 to March 31, 1860), is subjoined, arranged in two periods—before and after the house to house vaccination:

DATE.	CASES OF SMALL-POX ADMITTED :							
	In Vaccinated Persons.				In Unvaccinated Persons.			
	Con- fluent.	Discrete.	Total.	Deaths.	Con- fluent.	Discrete.	Total.	Deaths.
Oct. 1 to Jan. 21 -	2	49	51	1 (a)	29	12	41	14
Jan. 21 to Mar. 31	—	41	41	—	4	2	6(b)	—

(a) Not from small-pox, but from superadded disease. The case was that of a young woman, aged 20, whose attack of small-pox had been discrete and modified; she was convalescent, when she died suddenly without apparent cause. Examination after death was not allowed.

(b) Of which three occurred in a part of the district distant from that which had been visited from house to house.



## Appendix.

III. Epidemic  
Small-pox in  
London.2. In West-  
minster.3. In St. Pan-  
cras Work-  
house.

2. An attempt to deal in a similar way with the short-comings of Westminster failed, because I had not here, as in St. Giles', the support of the local authorities. Of all the unions I was called upon to visit, there was none which had suffered from small-pox so severely in proportion to its population as Westminster. The deaths in 1859 amounted (independently of three which took place in the Small-pox Hospital) to 35, twenty of which had occurred in the last quarter of the year, and nine of those 20 in the month of December.\* In January there were seven more deaths: and, notwithstanding the large amount of vaccination effected in that month, it appeared, on local inquiry, that fresh cases were occurring in unvaccinated individuals, especially in the parish of St. Margaret, where the numerical increase of vaccinations had not been so marked as in the parish of St. John. The particular localities were stated to me by the medical officers, who also expressed their willingness to undertake any measures of repression for which they should receive instructions from the Board of Guardians. Accordingly I waited on the Board at their meeting on the 26th January, and requested permission to call together the public vaccinators, with the view of setting on foot this systematic visitation. I laid the case before them, but found them unwilling to give any direct sanction to a measure of the kind proposed. Some experience, acquired (so the chairman said) during the time of cholera, had not rendered them favourable to house-to-house visitations; and after the Board had deliberated, I was informed that they considered that, in issuing the public notices and appointing so many vaccinators, they had done all that they were called upon to do, and that as regarded anything further, the medical men had the power in their own hands, and that if they liked they could use it. I endeavoured, as far as I could, to get visitations effected on this permission, but I soon found that the refusal of direct instructions had more weight one way than the permissive words had the other. Accordingly, the utmost I could get accomplished was the visitation, at my own urgent request, of a few localities in the parish of St. John, and, possibly, of one or two in the parish of St. Margaret. Certainly there was no visitation of any complete or effective kind. Contrary, therefore, to what occurred in St. Giles', the admissions of small-pox cases† in the parochial practice of St. Margaret during the month of February included as many unvaccinated as vaccinated cases, with, of course, the usual fatality in the former, and the usual immunity from death in the latter; and the total deaths in the united parishes from the beginning of February to the cessation of the epidemic in July amounted to 22.

3. The only other special step recommended had reference to the workhouse of St. Pancras. Towards the end of January a case of small-pox occurred in a girl, aged 18, with a slight vaccination

\* In many of the cases of small-pox, also, which had occurred in the Belgrave sub-district of St. George's, Hanover-square, the infection had been traced by Dr. Aldis to Westminster.

† Of 19 fresh cases admitted by Mr. White from February 1 to March 15, there were unvaccinated 7, of whom 3 died; vaccinated, 6, of whom none died; in 4 there is no statement as to vaccination; and of these, two recovered, and two were sent to Small-pox Hospital.



## Appendix.

III. Epidemic  
Small-pox in  
London.

mark, who had been for sometime an inmate, had had no contact (so far as was known) with any one affected with small-pox, and had not been near the perfectly detached building fitted up for the reception of such of the small-pox cases of the parish as could not be accommodated in the Small-pox Hospital. A few days afterwards, two old women, in a distinct part of the house, both above 60, the one with a good inoculation mark, the other with some pits of a previous attack of small-pox, were seized with the disease, and both passed through a well-marked, but very modified, form of it. On the evening of February 3, a child, who had recently been admitted into the school, who had been unsuccessfully vaccinated in the workhouse of St. Giles', and whose vaccination, when admitted into St. Pancras, had been postponed on account of its state of health, exhibited an eruption of small-pox. As soon as the first of these cases manifested itself, revaccination had been offered to such inmates as desired to avail themselves of it, and accepted by many; but, with the strong manifestations above stated of epidemic influence, I felt it necessary further to recommend that the arms of all the inmates should be examined, and protection given wherever required. The authorities at once gave instructions to Mr. Coster to act on this recommendation; and I had the satisfaction of hearing from him afterwards that many were revaccinated with success, and that two additional cases of small-pox only occurred, making six cases in all, of which that of the poor infant above mentioned was the only one which ended fatally.

Such is a statement of the recommendations given to the respective unions and parishes, the general effect of which was a large amount of vaccination and revaccination, accomplished in a very short time, and a most decided impression on the epidemic of small-pox.

Effect of the  
foregoing mea-  
sures on the  
number of pub-  
lic vaccina-  
tions,

And of revacci-  
nations.

Of the precise effect produced, even on the public vaccinations, I am not able to give any exact numerical statement. From 44 of the 133 parochial vaccinators in the 17 unions, I ascertained that the number of *primary* vaccinations performed by them in a few weeks (six, on an average of each statement), directly succeeding the introduction of these measures, amounted approximatively to 4,000; and, if the other parochial vaccinators vaccinated in proportion, we should have about 12,000 vaccinations performed in *six weeks* by operators, whose ordinary *yearly* number of vaccinations is only about 20,000. At the stations of the National Vaccine Establishment vaccination was carried on with corresponding vigor; and there was a very large, but not calculable, amount of vaccination effected by private practitioners. Of revaccinations it is still less possible to give an exact statement, for many public vaccinators kept no record of them, under the impression that they could not claim payment for them; and others had not, in entering their cases in their registers, distinguished primary vaccinations from revaccinations, as required by their instructions\* to do. But the amount of revaccination performed, either at the desire of appli-

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\* A more suitable form of register than the present, and one that shall provide a proper place of entry for each particular required to be noted, is urgently needed.



cants, or by direction of the medical officers of health, or in infected localities, was really enormous; nor, from the statement of the medical officers of health as to the manner in which, in many instances, the previous vaccination had been performed, can we hesitate to attribute to this amount of secondary vaccination an important influence in checking the epidemic.

Appendix.

III. Epidemic Small-pox in London.

Effect on mortality

Would not be manifested for some weeks.

Mortality in the various districts of London, and in each union of the districts visited.

As these measures were not commenced any where until January, and in some unions not till past the middle of that month, and as they required some weeks fully to carry them out, it is obvious that they could not affect appreciably the mortality of January, and that many of the deaths recorded in February, and even in March, would be in persons infected before the repressive measures had fully been brought to bear. The total deaths registered in the western, northern, and west-central districts, from February 1 to the end of the epidemic, were 187, of which 73 were recorded before the 17th March; and there were, besides, 49 deaths in the Small-pox Hospital of persons belonging to these districts. The following Tables show,—I. The mortality in districts for London throughout the epidemic; and, II. The mortality in each union of the districts to which this report specially refers: both arranged in two periods, viz., before and after January 31, 1860:

I.—MORTALITY from Small-pox in *London* during the Epidemic 1858–60  
(in Districts).

Deaths registered from Small-pox.	Districts and Population in 1851.					
	Western, 376,427.	Northern, 490,396.	West Central, 210,030.	East Central, 183,226.	Eastern, 485,522.	Southern, 616,635.
Quarter ending 31 Dec. - 1858 (a)	3	18	8	14	35	19
„ 31 March 1859	8	11	11	32	83	29
„ 30 June - „	13	20	5	14	96	57
„ 30 Sept. - „	20	20	8	47	91	73
„ 31 Dec. - „	46	42	29	44	86	120
In January 1860 - - -	13	21	16	13	25	41
Deaths in Small-pox Hospital to this date, referred to their re- spective districts - - - }	25	32	21	27	45	41
	128	164	98	191	461	380
In February - 1860 - - -	8	26	7	15	23	57
In March - „ - - -	24	16	12	15	17	60
In April - „ - - -	13	9	5	8	16	27
In May - „ - - -	7	5	5	7	7	26
In June - „ - - -	11	2	1	3	20	34
In July - „ - - -	8	9	3	3	6	9
In August - „ - - -	5	2	-	3	4	7
In September „ - - -	7	2	-	3	9	2
Deaths in Small-pox Hospital, re- ferred to their respective Districts }	19	23	2	12	7	20
	102	94	35	69	109	242
Total Mortality for each District - - - }	230	258	133	260	570	622

(a) As this and the following Table comprise the *entire* last quarter of 1858, the first five weeks of which were antecedent to the epidemic outbreak, the numbers will be found slightly in excess of those referred to at p. 56.



## II.—MORTALITY from Small-pox in each Union of the Western, Northern, and West Central Districts of *London*, during the Epidemic 1858-60.

		Unions and Population in 1851.																	
Deaths Registered from Small-pox.		Paddington, 46,305.	Kensington, 44,053.	Fulham, 29,646.	Chelsea, 56,538.	St. George's, Hanover-square, 73,230.	Westminster, 65,609.	St. Martin's, 24,640.	St. James, Westminster, 36,406.	Marylebone, 157,696.	Hampstead, 11,986.	Pancras, 166,956.	Islington, (a) 95,329.	Hackney, 58,429.	St. Giles', 54,214.	Strand, 44,417.	Holborn, 46,621.	Clerkenwell, 64,778.	
4th Quarter, 1858	-	-	1	-	-	-	2	-	-	-	-	10	8	-	2	-	3	3	
1st Quarter, 1859	1	1	1	-	-	1	5	-	-	4	-	5	1	1	2	3	3	3	
2d Quarter, "	1	4	-	-	-	1	5	1	1	4	2	10	3	1	3	2	-	-	
3d Quarter, "	8	3	1	-	-	1	5	-	2	3	-	7	8	2	4	2	1	1	
4th Quarter, "	14	2	2	2	2	5	20	-	1	13	1	15	11	2	14	8	2	5	
January - 1860	2	-	1	1	1	1	7	-	1	11	-	4	6	-	10	5	-	1	
Deaths in Small-pox Hospital to date this -	4	3	2	4	3	5	5	2	2	12	1	16	-	3	1	5	8	7	
	30	14	6	7	12	49	3	7	47	4	67	37	9	36	25	17	20		
February 1860 -	1	1	1	1	1	2	1	-	-	6	2	10	8	-	3	1	1	2	
March - "	5	1	2	2	1	10	2	1	1	8	-	5	1	2	1	1	4	6	
April - "	1	2	1	3	3	2	-	1	1	4	-	3	2	-	-	1	3	1	
May - "	-	-	2	2	-	2	-	1	1	1	-	1	3	-	3	-	2	-	
June - "	1	1	-	4	-	5	-	-	-	1	-	1	-	-	-	1	-	-	
July - "	-	4	-	2	1	1	-	-	-	4	-	3	2	-	2	1	-	-	
August - "	1	1	-	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	
September, "	-	3	1	2	1	-	-	-	-	1	-	1	-	-	-	-	-	-	
Deaths in Small-pox Hospital -	4	3	1	4	5	2	-	-	-	9	-	10	-	4	-	1	1	-	
	13	16	8	23	12	24	3	3	36	2	34	16	6	9	6	11	9		
Total Mortality for each Union or Parish -	43	30	14	30	24	73	6	10	83	6	101	53	15	45	31	28	29		

(a) The Islington deaths in the Small-pox Hospital I have been able, by the help of Dr. Ballard's monthly reports, to refer to their respective quarters or months; but I had not the materials for doing this as regards any other parish or union.

Of the 49 deaths which occurred in the Small-pox Hospital (44 in Table and 5 Islington deaths in the hospital, referred to their respective months), 13 were in unvaccinated adults, 10 in unvaccinated children, and 26 in persons having marks, such as they were, of vaccination. Of the 187 which occurred out of the hospital, I am



not able to give a precise account as to vaccination;\* but it is quite certain that the large majority were unvaccinated children. Some of these, as I have said, the repressive measures had not time to reach, and some they failed to reach, either because they were not carried out fully and with sufficient energy,† or from their own imperfection; for it is obvious that nothing short of a personal inquiry as to the vaccination of every person and child could have attained the *complete* protection of the population.

But, clearly to estimate what the measures did accomplish, it must be recollected that the period during which they were carried out was the period when epidemic force was culminating in the districts visited, and when therefore the mortality, which had already amounted to 400, should, but for them, have gone on increasing, as it had done in the southern and the other districts in which epidemic influence had earlier been felt: further, that, as regards particular parishes, *e. g.* Chelsea,‡ this period comprises almost the whole time of their subjection to the power of the epidemic.

From the commencement of the epidemic in November 1858 to its termination in September 1860, 2,063 persons fell victims in London to the disease.

In the southern, eastern and east-central districts, which comprised in 1851 a population of 1,285,383, the deaths were 1,442, or at the rate of 11·2 per 10,000 of population.

In the northern, western and west-central portions, which comprised in 1851 a population of 1,076,853, the deaths were 621, or at the rate of 5·7 per 10,000 of population, of which deaths only 231 (or 2 per 10,000) took place after the active measures to which this report refers.

## Appendix.

### III. Epidemic Small-pox in London.

Death-rate in the southern, eastern and east central group of districts;

And in the northern, western and west-central group;

\* The entries sometimes found in the death-registers, as to vaccination having been performed or omitted in cases of death from small-pox, are frequently not to be relied on. In the cases of five children, aged respectively nine, six, five, and four years, and 10 months, entered in the death-register of St. Margaret's as having died from small-pox after vaccination, I made personal inquiry. In 3, vaccination had not been attempted: in one, there was a clear history of a spurious and unprotective result; one only (aged 9) had been vaccinated some years before, and the mother said with effect, leaving scars on the arm. She died of petechial small-pox. The incorrect information regarding vaccination had been given to the registrar by the person who registered the death in answer to inquiries made by him, in obedience, he stated, to instructions from the Registrar-General. It would be better that entries respecting vaccination in fatal cases of small-pox should only be made in the death register on medical certificate.

† I have already referred to the deaths in Westminster. In several of the parishes there were no inquiries instituted on the registers from house to house. The Board of Guardians of Marylebone, in a communication to the Privy Council of January 31, stated, that they had taken steps to carry out all the suggestions of Dr. Seaton, except this one, 'it being the opinion of the Board that they would not be authorized in expending the parochial funds for that purpose.' Dr. Thomson, in his monthly reports for August and September, speaks of this as much needed, and regrets it had not been carried out. The disease lingered long in Marylebone, especially in the Christchurch district. In Islington, on the contrary, where the arrears of vaccination were very considerable, but where the greatest energy was manifested in clearing them off, there was but one death in March, although the number of *cases* reported to Dr. Ballard was larger in that than in any other month, and the total deaths from March to the termination of the epidemic were but 7.

‡ There had been a local outbreak of small-pox in Chelsea in the *summer* of 1858, which caused several deaths. But in the epidemic period, 1858-60, no death was recorded locally till the week ending December 10, 1859.



Appendix.

In each district the deaths were as follows :

III. Epidemic  
Small-pox in  
London.

And in each  
district.

District.	Population in 1851.	Total Deaths from Small-pox.	Deaths per 10,000 of Population.
Western - - -	376,427	230	6.1
Northern - - -	490,396	258	5.2
West Central - - -	210,030	133	6.3
East Central - - -	183,226	256	13.9
Eastern - - -	485,522	567	11.6
Southern - - -	616,635	619	10.0

This calculation, I need not say, is only approximative. There exist no sufficient data for making corrections on account of the increase of population, which has taken place in all the districts except the central ones ; but such correction, while it will lower the death-rate of each district, will not affect the relative position of the western and northern districts on the one hand, and of the eastern and southern on the other.

No death-rate  
cast for unions  
and sub-dis-  
tricts ;

But the rate  
varied from less  
than one to  
more than 40  
per 10,000 ;

And the high  
rate might have  
been prevented  
by measures  
similar to those  
adopted in St.  
Giles'.

In consequence of the altered population in so many of the unions, I have not attempted to cast a death-rate for each of them, still less for their sub-districts. But I may remark, that the weight of the mortality fell upon certain unions, and generally on certain sub-districts in those unions : that there were large and populous sub-districts, such as Brompton, Hanover-square, Charing Cross, or Berwick-street in the west ; St. Mary Marylebone, or West Hackney, in the north ; and Pentonville in the centre, whose united death-rate, even on the population of 1851, was not above 1 in the 10,000 ; while in Christchurch Marylebone, St. Mary's Paddington, Kentish Town, St. John or St. Margaret Westminster, or St. Giles' south, the rate varied from 5 to 15 per 10,000. The utmost death-rate which was attained in any sub-district of those to which this report refers, was 15 (in St. Giles' south) ; but in the other portions of London the death-rate in many sub-districts exceeded 20, and in the sub-district of Whitecross-street, St. Luke's, amounted to 41. And as in Westminster or St. Giles', so doubtless in all other particularly infected sub-districts, it was in certain parts of them that the disease was specially localised, and that the deaths principally occurred ; and the measure which so perfectly succeeded in St. Giles' would no doubt (the authorities taking the same enlightened view, and giving the same effective support) have produced the like result in every one of them. While the vaccination law is so imperfectly carried out as at present, an examination of the inmates of every house and room in any court or alley, where the small-pox breaks out, and the immediate vaccination of all the unprotected, is the only measure that can be relied on thoroughly to eradicate the disease.

II.—*The state of Vaccination in the Infected Districts.*

Neglect of  
vaccination ;

I HAVE already said that when this investigation was commenced, it was the opinion of the medical officers of health generally, and of



the district medical officers also, that there was a very considerable number of unvaccinated persons. The opinions of the medical officers of health were in some instances the result of precise inquiries, as in Paddington, where, in 280 houses, 83 unvaccinated children past the legal age were found by the sanitary inspector; in St. James', where 163 similar instances of neglect had been ascertained; in Marylebone, Pancras and St. Giles', where the same investigations had been made with like results: and those of the district officers were founded upon their daily observations in their intercourse with the poor.

Any precise estimate of the amount of neglect is wholly unattainable: but that which will approach most nearly to it is the result of the examination of the children in schools made by the medical officers of health. From the officers of the following unions I obtained exact numerical statements:

## Appendix.

## III. Epidemic Small-pox in London.

Its precise amount not ascertainable.

Result of examination of the children in schools by the medical officers of Health.

UNION.	Number of Children Examined.	Without Vaccination Marks.		Requiring Revaccination.
		Unprotected.	Protected by Small-pox.	
Paddington - -	2,296	212	33	424
Fulham - - -	1,646	98	23	37
Chelsea - - -	3,088	222 (a)	13	no account
St. Martin's-in-the-Fields	1,115	67	12	87
Pancras - - -	9,675	556	no account	1,398
Islington - - -	6,500	655	no account	183
Hackney - - -	5,020	32	no account	606
St. Giles' - - -	905	138	30	209
Holborn - - -	2,638	393	36	74
Clerkenwell - -	986	58	no account	no account
<b>TOTAL - - -</b>	<b>33,869 (b)</b>	<b>2,431</b>		

(a) Besides 24 others whose vaccination was "doubtful."

(b) I have also, through the kindness of the medical officers of health of Marylebone and Kensington, numerical statements, which make the total number of children examined above 40,000, and of children unprotected above 3,000; but either approximative numbers having been used, or it not being very clearly stated whether the term "unprotected" meant only the unvaccinated, or whether it might not include some who were doubtfully or badly marked, I could not introduce them into the Table. Of the school examinations in St. George's Hanover Square, Westminster, St. James', Strand and Hampstead, I have no complete account.

From this Table it appears that of 33,869 children examined, 2,431 or 7·1 per cent., were found wholly unprotected, in those districts which would probably be on the whole, from the nature of their population, the best vaccinated districts in London; although 14 months had elapsed since the epidemic had commenced in the metropolis, and although its force had for some time extended over to these portions of the town, and made itself felt, in some instances, even in the very schools examined, several of the children marked with small-pox having only recently suffered from the disease.

But this proportion (7·1 per cent.) is short of the proportion really

Proportion found unprotected.



Appendix.  
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 III. Epidemic  
 Small-pox in  
 London.

unprotected when the investigation commenced; for, the inquiry occupying many weeks, it was found, especially in the schools examined at a late period, that many of the children included in the class protected had only received their protection while the inquiry was going on.\* And I think it may very safely be asserted, that the actual number unprotected at the commencement was little, if at all, short of 10 per cent.

The proportion found unprotected in children thus examined may be assumed of the children (a very considerable number) on the books of the various schools who were absent from school at the time of the examination, and would probably be exceeded in the case of those children of the poor, of a similar age, who were not sent to school at all.

Dr. Ballard calculates that in Islington alone, making allowance for the children of parents who, from their position in life, would probably carefully attend to vaccination, there would have been about 4,000, from earliest school-age up to 15, either born in the parish or brought into it from other places, who had never been successfully vaccinated at all; and, on similar ground, Dr. Hillier calculates that there were 2,800 unvaccinated at these ages in the parish of St. Pancras.

The hopelessness of being free from fatal epidemics of small-pox while unvaccinated children are allowed thus to accumulate, is too obvious to need any comment.

You cannot fail to be struck by the extraordinary discrepancy shown in the proportion of unprotected in the schools of the various unions. The small number returned for Hackney is quite exceptional, and is due (1) to the examination having included, besides the ordinary parochial, ragged, and other charitable schools, many others of a class superior to that generally submitted to these investigations, as the Homerton Training College, the Birkbeck Schools, &c. &c.; and (2) probably to the large amount of vaccination which had been effected in Hackney in 1859, exceeding by more than 500 cases the year preceding. Excluding this union, the number unprotected varied from 15 per cent. in St. Giles', where it was greatest, to 6 per cent. in Fulham and Clerkenwell, where it was the least.† And much discrepancy was also found in the districts, and in the particular schools, of each union. It is impossible to make any classification of these: but one significant observation is made by more than one of the officers of health; viz., that while the proportion of children vaccinated in the ragged schools was by no means less than in many schools of the better class, the proportion of the unvaccinated who had suffered from small-pox (of course from their greater exposure to the contagion) was very much larger. The class from which these children come is, in fact, in this, as it has been called in other respects, the "dangerous class" to the community; it is the class

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\* In an important parish it came to my knowledge accidentally that some parents were deterred from sending their children to school, while this investigation was going on, until they had had them vaccinated, by the belief that, if the children were found unvaccinated, the penalty would be inflicted.

† It must be recollected that the children attending the schools in a union in many instances come from adjoining parishes or unions.



which, for their own sakes, and for the sake of the people at large, requires to be looked after; but it is also the class most accessible to the necessary inquiries.

The discrepancy also as regards the numbers marked off for revaccination in the various unions was very great, and arose not so much from difference in the number of children found with bad and insufficient marks of their vaccination, as from the different view taken by the various medical officers as to the extent to which revaccination, even of a badly vaccinated person, was required, or would be beneficial, where the children were young. And this view, again, was partly influenced by the extent to which the children were exposed, or likely to be exposed, to the full epidemic power. Thus Mr. Burge, who only marked out 37 children for revaccination, says, that there was a very large number of children with bad vaccination marks whom he did not think it necessary to have revaccinated. Dr. Barclay says, "A very large number of the children presented very imperfect marks; the worst only were selected for revaccination, above 12 years of age." Dr. Ballard, who marked out 183 children for revaccination, in consequence of their presenting only one or two marks "so faint and imperfect that the vaccination they had undergone could only be regarded as of very doubtful protective power," says also, "where the children in the schools were very young, I did not consider it desirable to recommend revaccination so long as even an indifferent vaccination scar was visible on the arm." Dr. Sanderson, while he noted off 424 with marks so bad that he did not think them safe without revaccination, has notes of 692 more with indifferent marks, in whom he did not think it necessary to recommend the operation. Dr. Hillier and Dr. Buchanan, having regard to the force and proximity of the epidemic in their respective parishes, wisely recommended revaccination to all where the marks were imperfect or indistinct. It is a matter for serious reflection, and deserves your most earnest attention, that so large a number of children should have so imperfectly received the protection which the law designed for them, and which, no doubt, it was believed they had fully acquired.\*

### III.—*Prospective Suggestions against recurring Dangers of Small-pox.*

It is probable that when the measures herein related were completed, the proportion of vaccinated in the districts of London to which this report refers was larger than it had ever before been. But now that the alarm of small-pox has passed away, it is certain that people will relapse into the old habits of indifference and neglect, and that, without constant vigilance, a re-accumulation of susceptible persons will take place, and go on till it shall attain the amount which will admit of another of those epidemic visitations, from which London is never free for more than two years together.

#### Appendix.

#### III. Epidemic Small-pox in London.

Number found badly vaccinated, or insufficiently protected.

Necessity of constant vigilance to prevent re-accumulation of neglect.

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\* Dr. Hillier remarks, "It was generally observed, that of the children who had been vaccinated in the country a larger proportion was not well vaccinated than of those vaccinated in London."



## Appendix.

III. Epidemic  
Small-pox in  
London.Two important  
checks :1. Inquiries by  
local vaccina-  
tion inspectors.

To provide against this kind of re-accumulation, two checks are, in my opinion, necessary :

1. Inquiries, instituted systematically, either on the birth register or from house to house (in localities which admit of this mode of proceeding) by local vaccination inspectors.

2. The adoption of a rule by all schools that no child should be admitted without evidence of having been satisfactorily vaccinated.

1. *Inquiries on the birth register, or from house to house*, with the use, in cases of neglect, of such a notice as was referred to at page 9 of this report, which are still carried on to a certain extent in a few unions in London by the sanitary inspectors, have for some time been systematically pursued at Reading, under direction of the superintendent registrars, with, I am informed, the most complete results; and on official visits in the country, I have myself found local registrars making these inquiries in various places with a success which has assured me that the plan only required to be generally followed out to produce a very satisfactory state of vaccination.\* Such action on the part of registrars is, I need not say, quite voluntary, and is taken in a very few places.

2. *The non-admission of children to schools without evidence of satisfactory vaccination* would be, as must be obvious from this report, a check of the greatest value. So far as private schools, or as charitable schools supported by private funds, are concerned, it must probably be left to the wisdom of the managers to adopt this check; but in the case of schools which derive any assistance from public funds, it would seem reasonable that the adoption of this rule should be insisted on. But the check, to be of use, must be thoroughly applied; and the production of the original certificate of vaccination, or the certificate of a medical man that he had examined the arms, and found satisfactory cicatrices of vaccination, should be in every instance required.†

In conclusion, I ought to express my deep sense of the kindness I experienced from all with whom, in the discharge of the duties here reported on, I was brought into contact; of the great courtesy and attention of the local authorities; of the frank and zealous manner in which the medical officers of health, district medical officers, and public vaccinators co-operated with me. I ought also further to express my thanks to those various officers for the valuable information which at all times I found them ready to afford me, and of which I have made full use in the compilation of this Report.

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\* One of the registrars of Birmingham succeeds in registering the successful vaccination of about 80 per cent. of the registered births, although there are some medical practitioners who refuse to give certificates. And one of the registrars of Liverpool registers about the same proportion. The medical officer of health for Clerkenwell states, as the result of his inquiries, that the neglect of vaccination does not arise from real objection, but from carelessness and thoughtless saving of trouble, and believes that if a local inspector were appointed, there would be very few unvaccinated.

† A mere rule, without satisfactory evidence, is of little use. In one of the schools in the Belgrave sub-district of St. George, Hanover-square, where such a rule existed, of 403 children examined by Dr. Aldis, 37 were found without vaccination mark: in several of the schools of St. Pancras there was the same rule; but of the 80 schools inspected by Dr. Hillier in that parish, there was *not one* where all the children were found vaccinated.



NO. IV.—DR. SEATON'S REPORT of Inquiry into the state of Public Vaccination in 41 Unions, comprising 152 Vaccinating Districts, made between June 25 and December 22, 1860.

THE 41 unions visited, enumerated in Table I., were in the counties of Sussex (6), Hampshire (9), Herefordshire (6), Gloucestershire (4), Warwickshire (7), and Northamptonshire (6), with two unions in Salop (Cleobury Mortimer and Shrewsbury), and one in Wilts (Salisbury). They were portion of a number of unions, in which the proportion of public infantile vaccinations (*i.e.* of vaccinations under one year of age) to registered births, on the return furnished to the Privy Council for the half-year ending Lady-day 1860, did not exceed 30 per cent., while the proportion of infantile vaccinations to births in one or both (generally both) of the two preceding years, as shown by the returns made annually to the Poor Law Board, had been below 50 per cent., which was in those years the average of the country at large.\* The parish of Alverstoke, the return from which had not been received at the time that my instructions were given me, was included in the inquiry, in consequence of many deaths from small-pox in 1858.

TABLE I.

Showing Unions inspected, Number of Vaccinating Districts, and of Public Vaccinators in each Union, and the proportion which the Public Infantile Vaccinations bore to the Registered Births, for the Years ending Michaelmas 1858 and 1859 respectively, and for the Half-year ending Lady-day 1860.

UNION.	Number of Vaccinating Districts.	Number of Vaccinators.	Infantile Vaccinations in proportion to every 100 Registered Births.		
			Year ending Michaelmas 1858.	Year ending Michaelmas 1859.	Half-year ending Lady-day 1860.
Rye - - -	4	4	12	30	15
Hastings - - -	3	3	14	16	15
Cuckfield - - -	6	6	54	31	30
Horsham - - -	6	6	38	56	25
West Hampnett - - -	6	6	38	65	16
Chichester - - -	1	1	35	15	18
Havant - - -	4	3	51	24	—
Portsea Island - - -	5	5	38	29	14
Alverstoke - - -	2	3	60	51	43
Fareham - - -	4	4	42	35	9
Christchurch - - -	2	2	32	26	18
South Stoneham - - -	4	3	37	35	8
Romsey - - -	4	4	42	51	8
Alresford - - -	1	1	27	30	6
Alton - - -	2	2	26	40	30
Salisbury - - -	1	1	21	20	15

(continued)

\* The public infantile vaccinations in 1854—the year following the enactment of the compulsory law—had been 65 per cent. of the registered births, but from this proportion there had been a progressive annual decline.



Appendix.

IV. Local inquiries as to vaccination.

TABLE I.—continued.

UNION.	Number of Vaccinating Districts.	Number of Vaccinators.	Infantile Vaccinations in proportion to every 100 Registered Births.		
			Year ending Michaelmas 1858.	Year ending Michaelmas 1859.	Half-year ending Lady-day 1860.
Towcester - -	5	5	19	32	6
Potterspury - -	4	4	4	3	—
Hardingstone - -	3	3	22	27	2
Northampton - -	3	3	7	12	7
Brixworth - -	6	6	(a)	31	23
Thrapston - -	5	5	91	38	27
Gloucester - -	2	2	(a)	17	9
Winchcombe - -	2	2	33	25	13
Cheltenham - -	5	5	67	36	28
Tewkesbury - -	3	3	25	17	29
Ledbury - -	3	3	17	20	—
Hereford - -	4	4	32	20	8
Dore - -	3	3	61	36	17
Weobly - -	3	3	31	20	14
Bromyard - -	1	1	38	26	8
Leominster - -	2	2	24	43	8
Cleobury Mortimer - -	1	1	12	10	—
Shrewsbury - -	6	2	No returns received.		
Birmingham - -	6	6		36	21
Aston - -	7	7	43	37	24
Meriden - -	4	4	53	46	16
Foleshill - -	4	4	48	29	12
Coventry - -	3	3	36	25	12
Stratford-on-Avon - -	7	7	26	25	25
Alcester - -	5	4	50	44	19

(a) Births not stated on return.

Scope of inquiry, and steps taken.

In carrying out my instructions to inquire in these districts into the state of public vaccination, and into various circumstances affecting it, I have taken the following steps: First, as in every union there are means of vaccination, of which no public account is rendered, I inquired what amount of unregistered vaccination might perhaps be due to such means, seeking thus to learn more exactly than the returns of the parochial vaccinators would (if taken alone) enable me to say, what in each district were the *relative numbers of vaccinated and unvaccinated* children. Secondly, I examined the local arrangements for public vaccination, with a view to ascertain how far they afforded facilities for the vaccination of the people, and especially for the best kind of vaccination. Thirdly, I inquired into the sort of vaccination current in each union, the qualifications of vaccinators and their deputies, and the observance of the regulations issued in regard to public vaccination by the Lords of the Council, under the powers of the Public Health Act. Fourthly, I inquired into the keeping of the vaccination registers, and the performance of the duties required of the registrars, under the 16 & 17 Vict. c. 100; and during my inquiry I offered to the local authorities such necessary suggestions as I was authorised to make to them.

# I. *Numbers of Vaccinated and Unvaccinated in the inspected Districts.*

## Appendix.

### IV. Local inquiries as to vaccination.

The means of vaccination, which existed independent of the public system,

ALL districts possess, to some extent, means of vaccination which are independent of the public (parochial) system, and which may be classed under one or more of the following heads:—1. Vaccination by public institutions or charities; 2. Miscellaneous gratuitous vaccination by medical men; 3. The gratuitous vaccination by medical men of their own patients, where the vaccination is by the custom of some places included in the midwifery fee. This would comprise any vaccination in connexion with lying-in clubs, &c. 4. Vaccination for which a fee is paid. There was no trace in the 41 unions of the arrangement, which I believe subsists in some mining, and possibly some other, districts of England, by which medical men are appointed by the proprietors or employers for attendance in sickness on the workpeople and their families, and for the vaccination of the children.

I inquired in each of the unions visited as to the existence of the means above stated, and the extent to which they were used:—1. *Public Institutions, &c.* In Birmingham, at the General Dispensary, there is a large station at which above a thousand children, chiefly belonging to the Birmingham and Aston Unions, are vaccinated every year, and whence lymph is supplied to the National Vaccine Establishment. Of these vaccinations, though not included in Table I., a public account is of course rendered. There was no other institutional vaccination regularly carried on in any of the towns, many vaccinations performed last year at the Northampton Dispensary having been done under special circumstances. Indeed, the once common practice of gratuitous vaccination at hospitals and dispensaries may be said to have been abandoned.\* 2. The same is nearly, if not entirely, the case with regard to that of *Miscellaneous Gratuitous Vaccination by Medical Men* (the “vaccination gratis” of shop windows, &c.). If here and there it be still carried on by an individual practitioner, it could be only to a very limited extent, and could have no appreciable effect on the general result. In a town of active professional competition like Birmingham, I was assured by the public vaccinators that it did not exist. 3. The professional feeling towards the public vaccinator, whose remuneration is made by law to depend on the numbers vaccinated by him, which has led to the abandonment of these means, has led also, in many of the districts visited, to the all but entire relinquishment of *gratuitous vaccination of any kind*, except as a matter of personal kindness and favour. This was especially the case as regards club vaccination, of which I heard in very few places. But in most towns there was a certain amount, and in some it was said there was a considerable amount, of the gratuitous vaccination of patients, more strictly private. Originally a great deal of vaccination of this kind went on everywhere; its continuance and extent appear to have been influenced chiefly by circumstances of competition—tone of professional feeling locally prevailing—the zeal, activity, and popularity of the public vaccinator. 4. The proportion of vaccinations

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\* An attempt was being made, I was told, to revive it at one or both of the Birmingham hospitals.



## Appendix.

## IV. Local inquiries as to vaccination.

*for which a fee is paid* by the patient would necessarily vary exceedingly, and would be very different in a town like Cheltenham, for instance, and in a country district. Some vaccinators of country districts, who privately and publicly vaccinated their entire districts, have assured me that the proportion who pay a fee is not five per cent.; but even in the largest and best towns it is said that the proportion is much smaller than would have been expected; many who once paid a small fee for vaccination having, since the establishment of the public system, either been vaccinated by the public vaccinator or gratuitously by their own attendants.

Two things were everywhere abundantly clear—the general disposition of those who sought vaccination to have it gratuitously, and the tendency of all gratuitous vaccination to merge in the vaccination of the public vaccinator.

Although it was impossible to ascertain in any union the numbers vaccinated by the means I have mentioned, or anything further respecting them than that there was more or less of this or that kind of vaccination going on, it was a matter of no difficulty to determine whether those means made up the deficiencies on the public returns. In no union was this the case, nor anything like the case. Throughout the country travelled over neglect of infantile vaccination to a very varying, but in the great majority of unions to a very considerable, amount was clearly established.

It was proved (1) by the testimony of the public vaccinators, registrars, and others, speaking from personal knowledge; (2) by the number of children and persons vaccinated by the public vaccinators above one year of age, and at all ages above one, independent of revaccinations or of postponement of vaccination for any reasonable excuse; and (3) by personal inquiry as to the state of vaccination of children, especially of children in the national, parochial, and other schools.

With regard to the extent of this neglect in the unions in the aggregate, it will be seen by the following table (Table II.) that while in 40 unions there had been in  $2\frac{1}{2}$  years 80,224 births registered, and 24,787 successful public vaccinations of children under the age of one (30 per cent.), there had been also 15,721 successful public vaccinations of children and persons at all ages above one.

did not make up the deficiencies on the public returns,

and neglect of infantile vaccination was clearly proved.

Neglect of infantile vaccination shown by the numbers who are vaccinated *above one year of age* by the public vaccinators;

TABLE II.

UNION.	Aggregate Registered Births in 2½ Years.	Aggregate Public Vaccinations under 1 Year of Age in 2½ Years.	Aggregate Public Vaccinations above 1 Year of Age in 2½ Years.	Number of Children examined in Schools.	Number of these without trace of Vaccination.	Number with doubtful trace of Vaccination.	Per Cent. of unvaccinated or doubtfully vaccinated.	Number of the unvaccinated or doubtfully vaccinated who had suffered from Small-pox.
Rye - - - - -	949	193	202	366	30	16	12·	1
Hastings - - - - -	1,697	259	242	610	96	25	19·	14
Cuckfield - - - - -	1,430	579	311	449	47	10	12·7	2
Horsham - - - - -	1,169	503	373	159	15	14	18·	1
West Hampnett - - - - -	1,114	505	393	214	15	5	9·	2
Chichester - - - - -	487	116	205	710	114	13	17·8	9
Havant - - - - -	478	140	398	284	24	5	10·	3
Portsea Island - - - - -	7,614	2,247	797	1,422	266	26	20·	127
Alverstoke - - - - -	1,768	935	224	166	20	2	13·	5
Fareham - - - - -	1,012	328	305	303	28	5	10·8	-
Christchurch - - - - -	708	189	139	474	66	3	14·5	-
South Stoneham - - - - -	1,940	578	756	336	19	8	8·	4
Romsey - - - - -	846	323	254	151	14	1	9·9	3
Alresford - - - - -	545	136	152	220	46	6	23·6	1
Alton - - - - -	957	320	334	477	43	13	11·7	2
Towcester (3 years) - - - - -	1,318	325	390	107	13	-	12·	-
Potterspury (2 years) - - - - -	1,076	28	38	-	-	-	-	-
Hardingstone (3 years) - - - - -	1,101	411	340	109	6	3	8·	1
Northampton (3 years) - - - - -	4,080	545	526	717	153	15	23·4	101
Brixworth - - - - -	1,268	456	189	39	5	2	18·	-
Thrapston (3 years) - - - - -	1,495	819	262	196	27	7	17·	-
Salisbury - - - - -	746	149	18	126	22	1	18·	5
Gloucester - - - - -	2,790	583	858	716	132	13	20·	54
Winchcombe - - - - -	771	204	543	93	7	3	10·7	1
Cheltenham - - - - -	3,178	1,582	2,585	304	25	5	9·9	6
Tewkesbury - - - - -	1,236	278	165	263	68	2	26·6	21
Ledbury - - - - -	1,016	156	151	88	13	2	17·	4
Hereford - - - - -	1,996	449	613	372	72	4	20·	21
Dore - - - - -	666	286	477	-	-	-	-	-
Weobly - - - - -	629	150	178	190	13	2	7·8	-
Bromyard - - - - -	951	257	402	222	42	6	21·6	2
Leominster - - - - -	1,168	328	350	114	26	12	33·	3
Cleobury Mortimer - - - - -	657	72	42	37	5	-	13·5	1
Shrewsbury - - - - -	-	no return	-	381	63	5	17·8	38
Birmingham (1½ year) - - - - -	12,135	3,792	436	-	-	-	-	-
Aston - - - - -	9,128	3,368	651	574	41	3	7·6	12
Meriden - - - - -	838	364	116	90	8	2	11·	-
Foleshill - - - - -	2,128	699	323	405	35	5	17·	10
Coventry - - - - -	4,112	1,120	560	502	58	4	12·	13
Stratford-on-Avon - - - - -	1,629	425	300	122	12	2	11·	-
Alcester - - - - -	1,404	590	123	259	39	3	16·	3
	80,224	24,787	15,721	12,349	1,725	254	16·	470

With certain exceptions, of which note is taken below,\* I was assured by the public vaccinators that the whole of these were cases

\* A considerable number of revaccinations in Cheltenham during prevalence of small-pox in 1858, 200 revaccinations in Winchcombe under direction of Board of Guardians, with special permission of the Poor Law Board, under the same circumstances, and many revaccinations in Chichester and Havant, are included in the table. Six hundred out of the 756 vaccinations "over one" in the South Stoneham Union, and 106 of the 254 in the Romsey



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## IV. Local inquiries as to vaccination.

and by the numbers found unvaccinated in schools, &c.

of arrear: and if, for these exceptions, and for cases legitimately postponed, the very large deduction of 20 per cent. be made, there would yet remain 12,567 vaccinated above the age of one, or for every two children vaccinated one neglected.

Neglect, therefore, of infantile vaccination to this extent was patent, but so far neglect had been repaired. But the local belief was, that there existed a large measure of neglect, not subsequently repaired; and that unvaccinated children, of all ages, would be found everywhere, and generally in considerable numbers.

The examination of the children in the national, parochial, and charitable schools proved the correctness of this opinion. In 38 of the 41 unions the arms of 12,349 children, of ages from about 2 to 12 or 15, were inspected by myself, generally in company with the public vaccinator. Of these, 1,725, or 14 per cent., were without the slightest trace of vaccination mark; in 254 more a doubt was possible. The whole 1,979 (16 per cent.) may certainly be regarded, so far as vaccination goes, as unprotected against small-pox. Those of the children who were in infant schools, or in the infant or younger division of some national schools (the general run of whose ages was from about 2 to 6, 7, or upwards), were unprotected by vaccination in a somewhat higher proportion. Of 2,768 such children, 528 (or 19 per cent.) were thus unprotected; and if from the 528 we deduct 49 in whom a doubt was possible, the number without trace of vaccination mark was 479, or 17 per cent. of the children examined.

Of the 1,979 children unvaccinated, 470, or nearly one-fourth part had already suffered from small-pox, and were thus secured from further attack. The remainder, 1,509, or 12·2 per cent. of all the children examined, were at the time of my inspection without any protection whatever against the infection of that disease. Of the younger children, the proportion without any protection exceeded 15 per cent. With such evidence of procrastination and neglect, we cannot wonder at the continued prevalence and fatality of small-pox among the children of the poor.\*

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Union, were in the practice of a vaccinator having a district in each of these unions, who carries on revaccination to an extent I have never before seen, and many or most of them were no doubt revaccinations. In other unions, though revaccinations may have been performed, they were not (except in a few cases of complete success in persons whose former vaccination was doubtful) brought into the account, the vaccinators considering that they were not permitted to charge for revaccination.

\* Above 9,000 children, under 10 years of age, died of small-pox in England, in the three years 1856-58, of whom more than 7,000 had not attained the age of five.

TABLE III.

Showing the Number of Children found unprotected, &c. in the National, Parochial, and other Schools.

SCHOOLS.	Number of Children examined.	Number unprotected by Vaccination.			Of whom — had Small-pox.	Per Cent. of Children examined, not protected by Vaccination.	Per Cent. of Children examined, unprotected either by Vaccination or Small-pox on day of Inspection.
		No Mark.	Doubtful.	TOTAL.			
Children in Infant Schools, or Infant Division of some of the National Schools - }	2,768	479	49	528	91	19	15·7
Children in National and other Schools - - }	9,581	1,246	205	1,451	379	15	11·2
TOTAL - - -	12,349	1,725(a)	254	1,979	470	16	12·2

(a) It is not to be inferred that in *all* these children vaccination had never been attempted, but only that they had never been successfully vaccinated. But in an immense majority no attempt had been made.

The amount of neglect in the different unions, and districts of unions, varied exceedingly. Not in any one of them has the intention of the Legislature, that children should be vaccinated within three or four months of birth, their health permitting,—the all but universal custom of the middle and upper classes of society,—been anything like attained. Even in the districts in which the proportion of infantile vaccinations to births was comparatively the most satisfactory, and the work of public vaccination was carried on regularly and systematically—as the Vale district of the Winchcombe Union, the district C. of the Thrapstone Union, or the Silverstone district of the Towcester Union—a large number of children were more than a year old before they were submitted to vaccination. In some districts there was a considerable amount of vaccination between the ages of one and two, still, however, leaving arrears; and in the great majority of districts, (comprising all in which, on the public returns, infantile vaccination appeared most deficient,) the arrears went on accumulating for years, until some particular circumstance—as some special means taken by the vaccinator, some interference of influence or authority, or, most frequently and most powerfully, the alarm of the presence or proximity of small-pox—caused them to be, to a large extent, cleared away. And whenever in Table II. the vaccinations above one are in large proportion, it is due to a clearance of this kind, either in the union generally, or in some portion of it; these vaccinations not being spread uniformly over the period of two years and a half, but occurring in some particular year, and generally in two or three months of that year.

The neglect varied much in different unions and districts; but in the best-vaccinated districts vaccination was unduly delayed, and in most districts arrears were allowed to accumulate.

Some of the more striking instances of the irregularity with which



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irregularity in  
the perform-  
ance of public  
vaccination.

the work of public vaccination thus goes on are exhibited in the Table below, in which, whenever a high figure occurs, it is due to one of the causes just referred to. The returns recently made to the Poor Law Board enable me to give this Table for the full period of three years, terminating at Michaelmas last.

TABLE IV.

UNION and DISTRICT.	Population in 1851.	Vaccinations under One.			Vaccinations above One.		
		1858.	1859.	1860.	1858.	1859.	1860.
Hastings, No. 2 - - -	5,621	10	6	40	14	7	147
Rye, No. 1 - - -	5,551	6	38	36	1	76	54
Rye, No. 2 - - -	2,220	8	33	29	1	16	65
Horsham, No. 7 - - -	1,252	4	30	12	1	106	2
Fareham, "Titchfield" - -	4,089	33	31	9	41	39	3
Havant, "Havant" - -	2,416	26	26	-	97	8	-
Havant, "Warblington" - -	2,302	40	10	10	143	4	5
Havant, "Bedhampton," &c. -	2,496	24	14	32	20	126	47
Bromyard Union - - -	11,683	141	99	66	337	62	70
Leominster, No. 1 - - -	9,068	89	120	24	93	160	10
Leominster, No. 2 - - -	5,770	27	80	35	24	70	31
Weobly, "Dilwyn" - - -	3,684	-	33	52	-	12	157
Weobly, "Wyeside" - - -	1,440	34	3	18	70	4	19
Hereford, "Burghill" - - -	4,772	35	29	-	85	21	-
Ledbury, "Bosbury" - - -	4,027	4	21	18	2	11	13
Winchcombe, "Hill" - - -	5,880	28	24	40	97	3	30
Cleobury Mortimer Union - -	8,632	39	32	19	23	18	14
Foleshill, "Exhall" - - -	4,629	40	32	20	32	10	21
Alcester, "Alcester" - - -	5,306	50	34	28	16	22	4
Thrapston, B. - - -	3,109	159	-	25	82	-	24
Thrapston, D. - - -	1,010	-	-	1	-	-	6
Brixworth, No. 2 - - -	3,423	36	22	66	12	15	238
Brixworth, No. 5 - - -	1,679	20	8	36	-	3	101
Northampton, "All Saints" -	13,110	7	41	96	-	72	145
Northampton, "St. Giles" -	14,370	16	65	115	5	51	173
Potterspurty, No. 1 - - -	5,788	11	2	4	12	-	-
Potterspurty, No. 2 - - -	2,390	5	12	(a)	8	11	(a)
Potterspurty, No. 3 - - -	970	7	3	15	6	11	50
Potterspurty, No. 4 - - -	1,548	-	-	-	-	-	-
Towcester, "Towcester and Pat- tishall" - - - - }	5,045	-	47	8	-	153	18

(a) 29 vaccinations returned for this district in 1860, but ages not distinguished.

Its perform-  
ance suspended  
in some dis-  
tricts and pa-  
rishes for long  
periods toge-  
ther ;

The neglect in many instances was extreme. There were districts of from 3,000 to 5,000 inhabitants and upwards, and many smaller districts and parishes, in which there had been no public vaccination performed, or but a casual vaccination for from one to three years. In the district B. of the Thrapston Union, in which it will be seen that 241 vaccinations are reported for 1858, there had been no vaccination for three years previous, and after this there was no vaccination again for two years, the vaccinations of 1858 having been performed in June and July, and those of 1860 not commenced till August. In district 4 of the Potterspurty Union, in the Pattishall district of the Towcester Union (now incorporated with the Towcester

district), and in district D. of the Thrapston Union, there had been no vaccination for three years. In another district of the Potterspury Union, which includes the town of Stony Stratford, and has a population of now more than 6,000, there have been only six public vaccinations at all ages in the last two years. Indeed, in the whole of this union, the population of which exceeds 10,000, and in which the births registered in the last three years have amounted to 1,070, only 186 public vaccinations have been performed at all ages during that period, not one-half of which were infantile vaccinations.

In the Towcester district of the Towcester Union, in which there was no public vaccination in 1858, the public vaccinator, about to resign his appointment, looked up his arrears, and vaccinated, in 1859, 200 children, of whom 153 were above one year of age. Since this, again, the infantile vaccinations have been but eight. In the Bosbury district of the Ledbury Union, in which the annual births are about 120, there are stated in the return to have been 69 public vaccinations at all ages in three years; but of these, it was ascertained on inquiry, only 36 were of children resident in the district,\* or at the rate of 12 a year. The extent to which arrears must be accumulating may be judged from the fact that, in 1857 there were found in this district above 400 unvaccinated children of all ages, from birth to 15 years, and some unvaccinated adults.† In the union of Bromyard there were 10 parishes, with a united population of 2,137, in which there had been no vaccination for above a year; and 10 other parishes, with a united population of 4,633, in which the vaccinations at all ages in the year were 17. The 314 vaccinations which are recorded in 1860 for district No. 2 of Brixworth Union, in which the vaccinations for the preceding two years had been but 85, and the 137 vaccinations in district No. 5 of the same union, in which in the preceding two years there had been but 31 vaccinations, were all performed in three or four months under alarm of small-pox, and were, as I was assured by the vaccinators, children who had never been vaccinated, with the exception of a few adults, some of whom also were unvaccinated.

Even in districts where upon the public returns the irregularity is less striking than in those included in the table, accumulations of arrears of the same kind were found to subsist either throughout the districts or in parts of them. Thus, in the Fareham district of the Fareham Union, the vaccinations at Porchester in 1858 and 1860 were 10 of children under one, 5 from one to two, and 27 from two to seven years of age. In the Widley and Wymering district of the same union, when there was alarm of small-pox in the union, there were vaccinated 7 under one; 8 from one to two; 39 from two to seven, and 15 from seven to thirteen years of age, not one of whom had ever been vaccinated before. Indeed, of the districts inspected, there were few in which there was not evidence of large accumulations of unvaccinated children having been brought for protection under alarm of small-pox.

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\* The vaccinator of the district resides (out of his district) in Ledbury, and is permitted by the guardians to vaccinate in that parish.

† 69 under one; 52 from one to two; 31 from two to three; 31 from three to four; 29 from four to five; 54 from five to six; 21 from six to seven; 26 from seven to eight; 24 from eight to nine; 20 from nine to ten; 60 from ten to fifteen; 32 above fifteen.



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and in others its amount very insufficient.

Although illustrations of the suspension, or all but suspension, of public vaccination for long periods together are taken, with the exception of Northampton (to be immediately referred to) from rural districts and small towns, the *numerical insufficiency* of vaccination was most clearly seen also in towns of considerable size. The following table of those unions, or districts of unions, in which 20 per cent. and upwards of the children in attendance at the schools were found unprotected by vaccination (one-half of which were towns of some size) illustrates this, as well as the far greater danger resulting from such accumulations in towns than in country districts.

TABLE V.

UNIONS in which, or in Districts of which, 20 per cent. and upwards of Children examined in Schools were found unprotected by vaccination.

UNION.	District, or Portion of District, in which Schools were situate.	Number of Schools visited.	Number of Children examined.	Number found unprotected by Vaccination.	Of whom — had had Small Pox.	Per Cent. of Children examined unprotected by Vaccination.	Per Cent. of Children examined unprotected by Vaccination or previous Small-pox on day of Inspection.
Portsea Island -	All (five) - - -	15	1,422	299	127	20·	11·
Northampton -	Town (part of two districts of the union).	7	717	168	101	23·4	9·3
Gloucester - -	The town (part of both districts of union).	10	716	145	54	20·	12·7
Hereford - - -	City - - - - -	6	372	76	21	20·	14·7
Tewkesbury - -	Town (part of Tewkesbury district).	4	263	70	21	26·6	18·6
Alresford - - -	At New Alresford, Ropley and Bishop Sutton	6	220	52	1	23·	(a)22·
Bromyard - - -	Bromyard, Cradley and Bishop's Frome.	6	222	48	2	21·6	(b)20·
Leominster - -	Part of Kingsland district.	2	114	38	3	33·	30·
Hastings - - -	No. 2 district - - -	2	176	38	5	21·	18·
Alcester - - -	Alcester town - - -	1	74	19	2	25·6	23·
Thrapston - - -	No. 1 district - - -	2	113	23	-	20·	20·

(a) Of the 168 children found vaccinated, 14 were under vaccination at the date of inspection. In the British school at New Alresford 34 per cent. of the children in attendance (53) were unvaccinated, and in the younger division of the national school 45 per cent.

(b) Of the 55 children in the Cradley schools, 30 per cent. ; of the 113 in the Bromyard schools, 22 per cent. ; and of the 55 in the Bishop's Frome schools, 11 per cent. had not been vaccinated.

In those places in which small-pox had extensively prevailed it appeared that many of the children who were found vaccinated in the schools had only received their protection during the prevalence of the epidemic, some two, three, or four years previously. Of

the unvaccinated, and still more of those unprotected whether by vaccination or previous small-pox at the time of inspection, the greatest proportion was always, as would be expected, amongst the youngest children, thus:—

TABLE VI.

UNION, &c.	Number of Children examined.	Proportion Per Cent. unpro- tected by Vaccination.	Proportion Per Cent. unpro- tected by Vaccination or previous Small- pox on Day of Inspection.
Northampton:			
National schools, &c. -	447	21·	8·5
Infant schools - - -	171	33·	19·8
Gloucester:			
National schools, &c. -	444	17·	9·9
Infant schools - - -	272	25·	17·
Hereford:			
National schools, &c. -	219	17·	12·
Infant schools - - -	153	24·7	17·
Tewkesbury:			
National school, and elder division, Trinity school -	230	21·3	13·
Infant class, Trinity school, ages 2 to 4 and upwards	33	57·5	51·5

These tables tell their own tale. There had been severe and fatal epidemics of small-pox in Tewkesbury in 1856, in Gloucester, Portsmouth, and Hereford in 1858, and in Northampton both in 1856 and in the year which has just passed: and it will be seen that in all these places the materials for further epidemic visitations were more or less rapidly accumulating. I must, however, for a moment call special attention to the town of Northampton, as affording the most remarkable illustration of the neglect of vaccination which has yet come before me.

There had been a severe epidemic in 1856; 144 persons died of small-pox in that year. I have not before me the Return of Public Vaccinations for 1857: but in 1858, the births in All Saints' and St. Giles' districts being above a thousand, the public vaccinations at all ages amounted to 12; in 1859, on the same amount of births, to 55. Small-pox re-appeared in an epidemic form early in 1860; and during March, April, May, and June, when it was at its height, there was a considerable, though, in proportion to the previous neglect, still very inadequate, amount of vaccination performed; but from the beginning of July to the date of my visit, at the commencement of December, *there were but 22 public vaccinations performed in the above districts, though small-pox had been continuously*

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and of the younger children a still larger proportion.

Consequences of past neglect, and results to be anticipated from continuance.

Case of Northampton.



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## IV. Local inquiries as to vaccination.

Of children found vaccinated, the vaccination of many had been delayed till small-pox had appeared;

and of others till long past infancy.

*present, and 32 deaths had within that period been registered from it.\** Of 168 children who had not been vaccinated in the schools and workhouse of this union 101 were marked with small-pox, being in fact *one-seventh* part of all the children examined.

In Shrewsbury, where the number of unvaccinated children was found rather below the ratio of 20 per cent (17·8), this was due to a considerable number having been vaccinated two years previously, when small-pox was epidemic; by no means to superior attention to vaccination, for in few places inspected was public vaccination more irregular or more insufficient. The children in this town who, not having been vaccinated, were found marked with small-pox, amounted to *one-tenth* of all examined.†

And in several of the unions in which the proportion of children found unvaccinated in schools was considerably smaller (10 per cent. or under), it was ascertained that many of the children had only been vaccinated two or three years before, when small-pox was prevalent (as, *e.g.*, in Cheltenham, Havant, Aston, and other unions). In some of the country schools, the low proportion was due to vaccination having been carried on recently in the schools themselves.

Reference to these and similar circumstances is always necessary in forming any comparative estimate of the usual condition of unions as to neglect of vaccination, from the result of the examination of children in schools, &c. But for other reasons, I need not say, no such comparison is attempted; for my examination did not extend always to every district of a union, nor did it comprise generally a sufficient number of children in each union to insure equivalent conditions as to age and other essential particulars. The vaccinating districts in which schools or workhouses were inspected were 78, the schools visited were 175, and the workhouses 16. As regarded the examination of children in schools, I was very much dependent on circumstance and opportunity; and the districts visited were sometimes those in which there was reason to believe vaccination was most neglected, sometimes those in which it was most attended to. In Towcester Union, where vaccination is much neglected in four districts, but well maintained in one, the result of school examination is no doubt more favourable than it would otherwise have been, from the majority of the children examined being in the best vaccinated district. And in many of the districts (included in Table IV), in which vaccination appeared to have been more than usually neglected, no school children were examined.

But of the insufficiency of vaccination, and of the accumulation of arrears in some portion or another of every union, these examinations gave abundant proof.

\* The town of Northampton consists of parishes in the Northampton Union, and of an extra-parochial portion. The births, vaccinations, and deaths given above are for those parishes only which are in the Northampton Union. There is a public vaccinator for the extra-parochial part of the town, appointed by overseers; but there has never been any public notification of the appointment, and it was not known to the registrar of births of his district. The deaths from small-pox in the extra-parochial part, for the period mentioned above (July to December), were 14. From the commencement of the epidemic in January, to December 7, the whole deaths registered *in the town* were 119.

† In Portsmouth they were one-eleventh; in Tewkesbury one-twelfth; in Gloucester one-thirteenth.



In reference to the accumulations found in large towns, I deem it of importance to observe that many of the children found unvaccinated in schools were not natives of the respective towns, but were immigrants from some other town, or from rural districts. And though I have no notes which enable me to support this by numerical statement, I was well satisfied that, under present circumstances, towns suffer much, not merely from their own neglect, but from the neglect in country districts.

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IV. Local inquiries as to vaccination.

Towns suffer from neglect in country districts.

## II.—*Arrangements for Public Vaccination in the Districts examined.*

By 3 & 4 Vict. c. 29, and by 16 & 17 Vict. c. 100, the guardians of every union, and the overseers of every parish in which relief shall not be administered by guardians, are directed to contract with the medical officers of their unions or parishes respectively, or with a legally qualified medical practitioner, for the performance of vaccination; to submit their contracts to the Poor Law Board; to conform to all regulations of the Poor Law Board; to divide the parish or union into convenient districts for affording facilities for vaccination; to appoint a convenient place in each district for the performance of vaccination, and to take the most effectual means for giving from time to time notice of the days and hours at which the medical practitioner contracted with will attend for the purposes of vaccination and inspection.

Duties of Guardians, under 3 & 4 V. c. 29, and 16 & 17 V. c. 100;

It is required of the medical practitioners contracted with to give attendance for vaccination and inspection in conformity with the terms of their contract; to keep, and at times appointed to submit to the board of guardians, a register of vaccinations in form provided; to give certificates of successful vaccination to the parents and guardians of the children vaccinated, and to transmit duplicate certificates to the registrars.

of public vaccinators;

And the registrars of births are required to deliver to the parent or guardian of each child, on or within seven days of the registration of the birth, notice of the requirement of vaccination in form appointed; to make a minute, in a book provided for the purpose, of the delivery of such notice; and to keep a register of all successful vaccinations of which they have received certificates.

of registrars.

It is an essential condition of every contract with a medical officer or practitioner, that the remuneration shall depend on the number of persons successfully vaccinated; and, as regards all contracts entered into after August 20, 1853, that this shall not be less than eighteenpence for each person vaccinated at the residence of the practitioner, or within two miles therefrom, nor less than half-a-crown for each person vaccinated beyond two miles from such residence.

Payment of public vaccinators;

And the payment to the registrar is made to depend on the number of certificates of successful vaccination received, and duly entered in the register.

and of registrars.

The report of the manner in which these requirements have been carried out in the 41 unions, will be most conveniently given under the heads of—1. Contracts; 2. Arrangements for Vaccination, &c.; 3. Public Notices; 4. Personal Notices, and discharge of Registrars' Duties generally.



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Public vaccinators were appointed in each union inspected ;

but the contracts had not, in some instances, been legally made and confirmed.

Importance of confirmation of contracts.

Terms of contract, in two instances, not in accordance with the law.

Payments under contract.

Division of unions into districts, &c.

## 1. Contracts.

In every union and district visited I found a medical man appointed for the performance of public vaccination. Previous to the Act of 1853 the Poor Law Board had not required any particular form of contract; but since that Act, they have (by a general order), required every contract to be in a special form. A copy of every new contract is to be sent forthwith to the Poor Law Board, who, for 14 days after receiving the copy, can exercise their power of annulling the contract.

But in several of the unions there were vaccinators appointed since the issue of this general order, with whom there was no contract, and whose appointment, therefore, was illegal. This was the case with the vaccinator of the Alton district of the Alton Union; the vaccinators of the Bordesley, Ashted, Castle Bromwich, and Sutton Coldfield districts of Aston Union; the vaccinator of Cleobury Mortimer Union; the two vaccinators for the six parishes of Shrewsbury; and the vaccinator for the parish of St. Andrew, Northampton. In Fareham Union there were no contracts, two of the four vaccinators at least having been appointed since 1853. In Winchcombe, Meriden, Hardingstone, and Towcester, there were also none. The vaccinators of the Hill district of the Winchcombe Union, of the Coleshill district of the Meriden Union, of the Towcester district of the Towcester Union, had each been appointed since 1853; of the other appointments I have no date.

The confirmation of contracts is a matter of considerable importance, as well for insuring that the vaccinators have all the qualifications which they are required by law to possess, as for securing that the terms of the contract are in conformity with the provisions of the law.

The arrangements in the Union of Cleobury Mortimer, and in the parish of St. Mary, Shrewsbury, were in direct contravention of the requirement of the law, that the remuneration shall be made to depend on the number of cases vaccinated, public vaccination being in these places included in the annual parochial salary. In both places the arrangement had acted very prejudicially to vaccination.

In other unions, the payment per case, whether under contracts before or after August 20, 1853, was generally at the minimum rate which that Act directed to be observed in contracts entered into subsequent to its passing. In no case was it below this: in some a higher rate of payment was made. In Alton 2 s. were allowed for all cases within two miles, and 3 s. beyond; in Westhampnett 3 s. for all cases; in Shrewsbury parishes (except St. Mary's), in Stratford-on-Avon, and in Meriden Unions, 2 s. 6 d. was allowed for all cases; in Alcester, 2 s. for all cases within two miles, and 2 s. 6 d. beyond.

## 2. Districts, Stations, and Attendances.

The primary division of each union for the purpose of public vaccination was the division adopted for medical relief, and the



medical officer of each district was also the public vaccinator.\* In each of the Unions of Havant, South Stoneham and Alcester, one medical officer held two districts. In three instances one vaccinator held districts in two unions. There were two medical officers (and public vaccinators) for the six parishes of Shrewsbury. In the parish of Alverstoke there was, in addition to the medical officers of the parish, a public vaccinator not holding a Poor Law medical appointment. Hence for the 152 districts, as set out by guardians and overseers, there were 143 vaccinators.

In some unions each district officer was so far public vaccinator for the whole union, that he was allowed to vaccinate persons resident in any part of the union. But in this case it was almost invariably understood between the vaccinators, that in each district any public vaccination, other than by the appointed medical officer of the district, should be limited to applicants at the surgery of the vaccinator, or to those who, being his private patients, were vaccinated gratuitously; and that what was termed the "looking-up" of the district, belonged to the district vaccinator only. But in by far the larger number of unions, each vaccinator was limited by the Guardians to his district.

In those districts in which the vaccinator was resident, his surgery was generally, but not invariably, an appointed station for vaccination; and in some, no other station had ever been appointed, or was required. But in most districts, including all rural ones, there were originally one or several other places appointed. In the districts in which the vaccinator was non-resident, one or more places within the district were appointed for vaccination, or it was stipulated by the contract that he should vaccinate from house to house; it was also understood, and generally was so stipulated, that persons might be vaccinated at his residence at stated times.

The attendances for vaccination and inspection, as prescribed by contracts, were—1. As regarded the public vaccinator's surgery, at a specified hour on one, two, or three days in each week, or daily; 2. As regarded other places or stations, attendance at a specified hour on one or two stated days in each week, or (in nearly all rural districts), on one specified day in every month or every two months, with attendance the week following for inspection.

But in almost all the districts inspected there was a difference, and generally a very considerable difference, between the plan prescribed by contract, and the method in actual operation.

Before entering further on the subject of local arrangements for vaccination, I will remark that the test of their excellence is the extent to which they facilitate, so far as the circumstances of the district or locality render possible, vaccination from arm to arm, and allow, from the number of children vaccinated on each occasion, of selection of cases from which to carry on the stock of lymph: in a word, *arm to arm vaccination, with due selection of lymph*.

Experience acquired at the stations in connexion with the National Vaccine Establishment, and at other public stations in some of the

Arrangements for public vaccination, as prescribed by contract,

differed generally from those actually followed.

Test of excellence of local arrangements for vaccination, the facility afforded for vaccination from the arm, &c.

Vaccination in this way can only be pro-

\* Except in one district of Alresford Union, in which the medical officer had declined a contract for vaccination. The medical officer of the other district was then appointed public vaccinator for the union.



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perly carried on  
*continuously*  
under certain  
conditions,

which are only  
attainable in  
large towns ;  
but in these  
vaccination  
should be al-  
ways thus  
maintained,

which is not  
the case at pre-  
sent.

large towns of England, has shown that vaccination from arm to arm cannot be maintained *continuously*, without special pains and contrivance on the part of the vaccinator, still less with due provision for selection of lymph, where the annual applicants are fewer than 500, the vaccinations being performed on a single week-day. This average attendance of 10 on each vaccinating day is found to imply that occasionally (especially in winter) there are days when only two or three children are brought to the vaccinator, on whose suitability for transmitting lymph the continuance of the station (without the use of stored lymph, or help from without) depends. Vaccinators performing from 350 to 400 vaccinations a year (an average of about seven or eight on each vaccinating occasions), have been able, by a little contrivance, to maintain a continuous supply from arm to arm, or have only rarely been obliged to have recourse to other stations, or to use stored lymph. And although with a smaller average attendance even than this, vaccination has, in some instances, been maintained continuously from the arm, this has only been accomplished by special pains and under conditions which have obliged the vaccinator often to depend on the success and suitability of single cases for the maintenance of his lymph. Stations at which 500 and upwards are vaccinated yearly may be called Class A. ; those at which from 350 to 500 are vaccinated, Class B. .

It is obvious that stations of either class could only be maintained in towns of some size. Of the towns visited in the course of this inspection, Birmingham (which includes the Birmingham and part of the Aston unions), Coventry, Portsmouth, Cheltenham and Northampton, might maintain one or more stations of the Class A. ; Gloucester and Shrewsbury, from their population and number of annual births, should admit a station of the Class B.\* Parents should be able in these towns to claim weekly from the public vaccinator, or public vaccinators, the vaccination of their children direct from the arms of other children, under the best conditions.

But it appeared that, by the arrangements now in operation, there was in these large towns, from the number of vaccinators and stations, the frequency of stational attendances, and the performance of vaccination in some of them to a considerable extent at people's houses, much vaccination with dry lymph, and that much of the vaccination which was carried on from the arm was not under the most advantageous conditions. There was no vaccinator whose station was of the first class; there were only five vaccinators (three in Birmingham and two in Aston) who had stations of the second class.

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\* The *annual public vaccinations* at present in Gloucester, Northampton, and Shrewsbury, are quite insufficient for the purpose ; but with due observance of vaccination, this would not be so.

The vaccinating arrangements prescribed were as follows :—

Examination of  
arrangements  
in detail.

TABLE VII.

UNIONS.	Annual Births, (generally on Average of Three Years.)	Annual Public Vaccinations, (generally on Average of Three Years.)	Number of Vaccinators, Number of Stations, and Plan of Stational Attendances.		
			Vaccinators.	Stations.	Attendances.
Birmingham - - -	8,103	3,120	6	15	At 10 stations once a week. At 1 station twice a week. At 4 stations daily.
Aston (4 districts) - -	2,761	1,310	4	4	At each once a week.
Coventry - - -	1,648	785	3	4	At three (surgery of each vaccinator) daily.
Portsea Island - - -	3,041	1,362	5	5	At one once a week. At 2 stations twice a week. At 2 stations three times a week.
Cheltenham (town) -	about 1,000	593	5	5	At 1 station daily. At 2 stations once a week. At 3 stations daily.
Northampton (town, part of 2 districts of union).	about 1,000 (a)	128	2	2	At each once a week.
Gloucester (city, part of 2 districts of union).	- (a) -	- (a) -	2	2	At each once a week.
Shrewsbury - - -	747	- (a) -	2	2	At each once a week.

(a) The extra parochial portion of the town of Northampton is not included. In Gloucester, town and country are so mixed up in the registration and vaccinating districts, that the numbers for the city only cannot be given. In Shrewsbury the vaccinators have not kept registers, and the number of vaccinations cannot be given.

But those in actual operation were in most districts considerably different; and though in some there had been concentration of arrangements, in others the plan pursued still less admitted of vaccination from the arm than that laid down.

In Districts 1 and 5 of Birmingham, the arrangements had been concentrated with great advantage; two stations, with one weekly attendance at each, having been substituted in the former for four stations with five weekly attendances, and in the latter a daily station having been discontinued, and the vaccinations all practically brought to the station with a single weekly attendance. One of the stations in District 1, and the station in District 5, were of the Class B. In District 2 the "daily" station had also practically been abandoned, and the other station, where vaccination was performed once a week, was of the Class B. The opportunity of making this a station of the very highest class was thrown away by the habit which had crept in of vaccinating large numbers at their own houses. The vaccinator's register showed that of 802 vaccinations performed between November 2, 1859, and September 25, 1860, 378 were at the appointed (St. George's) station, 21 at the station which I have said is practically abandoned, and 403 at the houses of the people. In District 3, with less than 500 vaccinations a year, of which many were performed at the houses of the people, vaccination was

In Birmingham.



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## IV. Local inquiries as to vaccination.

professed to be carried on once a week at two stations. In District 4 no house vaccination went on, but all were brought to one station, at which, however, vaccination was carried on "daily;" and the 218 vaccinations there performed between the 4th of January and 4th of September, 1860, were on 73 vaccinating days. And the opportunity of a first-class station in District 6 was thrown away, not only by the attempt to maintain three, but by the vaccinations at the surgery, which is the chief station, being performed without distinction of days. There can be no doubt that it is to its superior arrangements in this respect that the dispensary of Birmingham owes so much of its popularity as a vaccinating institution. It was in jealousy of this, as they candidly stated, that some of the vaccinators sought and secured the people at their own houses. I venture to think they would more completely have attained their object had they directed their energies to the establishment of stations, with equal advantages.

## In Aston.

At two of the four stations in Aston Union, the once a week vaccination was carried on with great regularity, and they constituted efficient stations of the Class B. There was no home vaccination in these districts, and they were numerically better vaccinated than the other two. In one of the remaining districts there was vaccination at houses, and the vaccination at the station ("surgery") was not limited to the appointed day, so that lymph was often lost. The vaccinator of the other district kept to his appointed day; but the number of applicants had not been such as to enable him to maintain his vaccinations constantly. He had not been very long appointed; the district had been greatly neglected by his predecessor; but the attendance was rapidly improving.

## In Coventry.

In Coventry, the "daily" vaccination offered implied, for the most part, that people might apply at the surgery any morning, and would learn when they could have their children vaccinated. None of the vaccinators was able to maintain vaccination, as must be obvious, throughout the year; but each, when he began, vaccinated from week to week for as long as he was able. Vaccinations were not performed at the people's houses; but one of the vaccinators, in addition to his surgery and the station advertised for weekly attendance, had also constituted another station in the surgery of his son.

## In Portsmouth.

In Portsmouth, the vaccinator who vaccinated daily, and one of those who vaccinated three times a week, performed their vaccinations when the application was made, if they had lymph in store, otherwise made arrangements for vaccinating as soon as they were able afterwards. The other three stated that they had brought their vaccinations practically to one week-day, or nearly so, though a few vaccinations were performed on the off-days. It is needless to say that no vaccinator maintained arm to arm vaccination throughout the year.

## In Cheltenham.

In Cheltenham, at one of the stations at which vaccination was announced for every Monday, the bulk of the vaccinations was performed on the appointed day; but persons were vaccinated also on whatever day they might apply. At the other station announced as "every Monday" there was no observance of days. Between



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October 3, 1859, and September 5, 1860, there had been at this station 62 vaccinating days (any week-day indifferently), and on 46 of these there had been a but single vaccination. The vaccinations for the 11 months amounted altogether to 91. The daily vaccination of the other vaccinators meant that people were vaccinated as they might apply; "if they were not, they would go to some one else." Generally the fact of a child being under vaccination, when known to others, was an inducement to them to apply at that particular time, and thus many were vaccinated from the arm. But still, with these arrangements, the maintenance of vaccination from arm to arm for any length of time, or under any conditions of selection, was out of the question; and there was necessarily much vaccination with points, or lymph stored in other ways.\*

The towns of Northampton, Gloucester and Shrewsbury, which I have before cited as conspicuous for their neglect of vaccination, were each divided between two vaccinators, neither of whom, of course, was able to maintain vaccination continuously.

In towns of smaller size, whether constituting unions, as Salisbury, Chichester; districts, as Gosport, Hereford, Havant; or portions of districts, as Rye, Hastings, Horsham, Christchurch, Fareham, Romsey, Leominster, Stratford-on-Avon, Tewkesbury, Ledbury, Stony Stratford, Towcester, Alcester, &c. &c., it is obvious that vaccination from arm to arm could not be continuously maintained; and that the proffered vaccination once a week, twice a week, or daily, throughout the year, in these places, or in other small towns or villages of the unions visited in which a public vaccinator was resident, could in very many instances only mean one of two things—either vaccination with stored lymph, or that it might be learnt, on application to the vaccinator, *when* the vaccination could be performed.

Public vaccination in smaller towns;

I found that in some of these places the vaccinators took great pains, by confining their vaccinations nearly, if not entirely, to certain periods of the year, or by vaccinating only at intervals, to maintain the vaccination from arm to arm, and that they did this successfully for many weeks, and occasionally for months together. Sometimes, that they might not lose their lymph, they were careful not to vaccinate too many at one time; and often, not to lose their lymph, they were obliged to seek out some child, or to vaccinate some child known to them, the applications at the surgery or station having failed. In other places the work of vaccination was carried on with much less method: a good deal, or perhaps most of it, was done from the arm on the regular day; but vaccination was also carried on, at the same time, on other days. In others vaccination was performed when applications happened to be made, generally, of course, with dry lymph; and no pains seem to have been bestowed

how carried out.

\* Vaccinations in three districts of Cheltenham in 11 months:

Vaccinator.	Vaccinations performed.			Number of Vaccinating Days.		
X	-	-	-	173	-	89
Y	-	-	-	62	-	34
Z	-	-	-	91	-	62



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Periodical vaccinations, publicly announced, the most eligible plan.

Public vaccination in rural districts,

cannot be maintained weekly ;

and frequent stational attendances are not desirable.

The arrangements prescribed were not now carried out,

on continuing the supply. In some, as I have already said, the practice of vaccination was for long periods suspended altogether.

As in towns such as I have named, the population of the largest of which (Hereford) did not, in 1851, much exceed 12,000, public vaccination can only be properly carried out *at periods*, it is highly important that this plan of vaccination should be authoritatively substituted for the one now directed and announced, but not really pursued, and that there should be means of apprizing the public on each occasion *when* the work of vaccination is going on. No public notices of this kind are now given, and it has depended on the vaccinator to diffuse, as best he could, the knowledge of the fact. In some places the vaccinators have taken great pains, and have availed themselves of the help of the registrars, who have occasionally supplied them with, or allowed them to take, lists of births for this purpose; but these personal exertions cannot be generally or regularly looked for, and it is obvious, besides, that the knowledge would not, by these means, reach all whom it concerned.

In rural districts a very elaborate plan of carrying into effect the Act of 1853 was attempted. Stations were established in considerable number: either one for each parish, or one for two, three, or more parishes, with attendance of the vaccinator either once a week, once a month, or once in two months. But everywhere it was required that not more than two months should pass without an attendance of the vaccinator.

There are few rural unions in which the births would admit of weekly vaccination being maintained at many stations at the rate of even one child per week, supposing the applications for vaccination to have been distributed with uniformity over each week and station. In the Brixworth Union, with nine or ten stations, there were prescribed 468 or 520 attendances of the vaccinators each year for the performance of between 300 and 400 vaccinations. In the Stratford-on-Avon Union, with 34 stations, the attendances in the year for the vaccination of about 400 children would have been 1,768. Even with attendances once a month, or once in two months, where the stations were numerous, the vaccinations in many unions would not, on the average, be more than one, two, or three for each attendance of the vaccinator; as in Christchurch Union, where, independently of weekly vaccination at the vaccinators' surgeries, the prescribed monthly attendance at 10 stations gives 120 attendances for the vaccination of from 150 to 200 children annually; or in Alresford Union, where attendance every two months, at nine stations, gives 54 attendances a year, in addition to the prescribed weekly attendance at the surgery, for vaccinations which would only amount to about 150, or possibly a few more: while, by the very condition of vaccination once a month, or once in two months, the vaccination from arm to arm is precluded.

On the first establishment of these stational attendances in consequence of the enormous accumulation of arrears, and the strong belief in the minds of the people that vaccination would thenceforth be regularly enforced, they were in most unions for a few weeks or months well maintained; but soon the attendances, whether of the people or the vaccinator, ceased to be regular; and now the



plan so carefully laid down by contract has almost everywhere been abandoned.

In a few districts, not above half a dozen on the whole, it was said to be still the plan in operation; but it was allowed by the vaccinators that more frequently than not there were no applicants, under which conditions it would not be wonderful if also, as was stated to me, there was more frequently than not no vaccinator. At some one or other of the prescribed periods, however, the vaccinator and the people must have met, for the vaccination of the districts, I was assured, was thus carried out.

But in many districts, the original stations being retained, or others, where more convenient, having been substituted, the plan has been adopted of going through the district at one or at two periods of the year, vaccinating at each station for three or four weeks in succession, or as long as there were applicants. The registrars sometimes gave most efficient help to vaccinations of this kind by supplying the vaccinators before hand with lists of children born; and when the registrars were, as is often the case in country districts, the relieving officers, they were generally the chief means of diffusing information of the intended vaccination. The vaccination of the Dewchurch district of the Hereford Union was carried on in this way. Mr. Thomason told me that at first he found a little difficulty in getting the people to the station, but now they quite understand the plan, and come readily. On his first attendance at any station he finds but few to do, but the week following a great number, who come to be vaccinated from the arms of the children of the week preceding; a third or a fourth attendance exhausts the station. Mr. Wood, the vaccinator of the Yarkhill district of the Ledbury Union, gave an almost exactly similar account. He said he never failed to find an attendance: for, in the first place, the people knew they might absolutely rely on his being there; and, in the second place, they knew also that his attendance at the station would cease the instant he found no applicant, and that when once attendance at that station had ceased, it would not be renewed till the next vaccinating period. He finds that about three attendances work out a station. There were several other instances of districts gone over systematically in this way. In other districts, though with less system, the stations were used for vaccinations from time to time by appointment. In the Hardingstone Union the vaccinators were supplied by the guardians with printed forms for these appointments.

A vaccinator of one district of the Thrapston Union (Dr. Starling) having a district also of the Wellingborough Union, was able, with the aid of quarterly lists from the registrar, to carry on his vaccinations from week to week throughout the year. His plan was to visit each parish in succession, always getting the children together at the stations, not vaccinating at their houses. He said that vaccinating thus from week to week with a limited number of subjects, his lymph from time to time deteriorated, and on this account it became necessary to renew from the establishment occasionally. His district was numerically one of the best vaccinated that I have inspected.

In very many of the rural districts the stations have been abandoned altogether, the vaccinator's house being the only appointed

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#### IV. Local inquiries as to vaccination.

except in a few districts.

But others had been substituted, of which, generally, no public announcement had been made.



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place for vaccination. The distance to be travelled for vaccination is thus often many miles. In some of these districts, however, the parishes were visited by the vaccinator regularly, in others occasionally and irregularly: the vaccinations being performed either at the houses of the people; or the house at which a child was under vaccination being made a temporary station, or rendezvous, at which neighbouring children were collected; or another place for assembling being named. But several districts, and very many parishes, were not visited for vaccination for long periods together.

The vaccination at the houses of the people, which, where population is thinly scattered, offers conveniences both to people and vaccinators, appeared to be well carried out in one or two small districts; but there were few districts of any size in which it was professed which were numerically well vaccinated. Its disadvantage as regards vaccination from the arm is obvious.

Circumstances chiefly influencing the amount of vaccination in districts.

Whatever the particular plan of vaccination pursued, the degree of completeness with which a district was vaccinated, depended to a great extent on the good understanding and active co-operation of the birth-registrar and vaccinator.

In a few instances, lists of the births in the district were *regularly* (as quarterly) supplied to the vaccinators; in several instances, such lists were supplied from time to time; but in the great majority of districts they had not been supplied, nor asked for.

Upon these lists visits were paid either for the vaccination of children at their homes, or for informing the parents when and where the children could be vaccinated. Most frequently, when vaccination was carried out at stations, they were used for the purpose of "looking up" those who had failed to attend at the station.

Sometimes the registrars themselves looked after cases of default, or lent active assistance to the vaccinator in so doing.

This plan involves an amount of labour which, I imagine, was not contemplated by the Legislature when it fixed the remuneration of the vaccinator at eighteenpence and half-a-crown, and that of the registrar at threepence per successful case; nor can it be expected that, under present arrangements, it will be at all generally or regularly carried out. And although its results when adopted were very satisfactory, and productive of a *comparatively* good state of vaccination, they were far from accomplishing the complete vaccination of any district. Registrars and vaccinators all seemed to agree that this would not be attained until there was some person appointed in each district to carry into effect the provisions of the compulsory law; and they were quite as unanimous that the moment it was understood that these provisions would be carried out, there would be very little further trouble. The way in which vaccination was attended to for a few months after the passing of the Act of 1853 was cited everywhere in proof of this.

Without the aid of the registrar, a considerable, but less complete, amount of vaccination was effected in all districts in which the attendance of the vaccinators was regular and systematic.

Wherever districts and parishes were unvaccinated for long periods together; or the amount of vaccination was merely nominal,

General testimony of vaccinators and registrars, as to necessity for carrying out the compulsory law.



this appeared to be due either to the non-attendance of the vaccinator, or to want of proper means of informing the people when vaccination would be carried on, or to some other special local defect. In regard to some parishes and districts not vaccinated for three years, it was admitted by the vaccinators that no attendance had been given for the purpose; and as regarded others where the neglect was less extreme, I was assured by registrars and relieving officers that great complaints were made sometimes by the people that they could not get their children vaccinated; and that the question was repeatedly asked, "*When is the vaccinator coming?*"

Prejudice and apathy of the people, which still prevail unfortunately to a large amount, and are obstacles everywhere, were said to have peculiar strength in some of the districts in which vaccination was found most defective. While I do not doubt this, I must hesitate to attribute to them *all* the influence that was ascribed. Certainly some of the best and some of the worst vaccinated districts that I had to inspect were side by side in the same union, and inhabited by the same class of people.\*

The reason for taking as the test of vaccinating arrangements the extent to which they facilitate vaccination from the arm, with due selection of lymph, was the all but uniform success attending this mode of operating. But I must not leave the subject without a few words on the preference of the public for vaccination thus performed.

"They like to see the child from whom the lymph is taken;" "The temptation to vaccination with them is a good arm." "When I call on them, they refuse to let me do it, and say they will wait for an arm," were expressions frequently used to me by public vaccinators in the course of this inquiry. One of the vaccinators of Gloucester (Mr. Carter) told me he had found this feeling so strong, and was himself so sensible of the value of arm to arm vaccination, that in the fifteen months he had held the appointment he had never performed a single vaccination otherwise; with his limited numbers, this was only accomplished with infinite pains, and in fact could not have been done at all without the co-operation of another medical man, who had a large midwifery practice. I have seen people leave a station where point vaccination was going on,† declining to have their children so vaccinated; one assigning as a reason, in answer to my inquiry, that her child had already been twice done in that way without taking. And I know that children are carried sometimes considerable distances, though there are public vaccinators living close by, to secure the advantages of the vaccination most approved.

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Vaccination from the arm the most popular;

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\* Compare the Yarkhill with the Bosbury district of the Ledbury Union; the Silverstone with the Pattishall or Blakesley district of the Towcester Union; the district C. with the districts B. or D., of the Thrapstone Union, or the Bugbrook district with the other districts of the Northampton Union.

† In Birmingham. Whatever the difficulties of maintaining vaccination from the arm in country districts, it is utterly monstrous that public vaccination in such towns as London, Birmingham, Cheltenham, &c. should be carried on in any other way.



and those districts in which most attention was paid to it, numerically the best vaccinated.

It is no doubt the result of this feeling that, whether in town or country, the districts which appeared to be numerically the best vaccinated, were generally those in which the arrangements were most calculated to secure vaccination in this manner.

### 3. Public Notices.

The public notices required by 16 & 17 Vict. c. 100, to be given *from time to time*,

By 16 & 17 Vict. c. 100, it is required that guardians and overseers shall take the most effectual means for giving *from time to time* to all persons resident within such district (*i.e.*, the district set out for vaccination), due notice of the days and hours at which the medical officer, &c. will attend for purposes of vaccination and inspection.

were issued in 1853 in all the unions inspected, except two;

When the arrangements required by that Act to be made within six weeks of its passing were complete, notices of these arrangements were placarded in a form supplied by the Poor Law Board in all the unions or parishes which I inspected, except Salisbury and Shrewsbury. No public notice was put forth in those towns.

but in many had never been repeated,

In many unions this publication had never been repeated; and no public notice of any kind in regard to vaccination had since been issued. This was the case in Alresford, Havant, Fareham, South Stoneham, Weobly, Dore, Gloucester, Tewkesbury, Foleshill, and some others; and though there had been a second issue of these bills in Horsham, Portsmouth, Christchurch, Alcester, &c., this had been many years ago. In many of these places the vaccinators and stations had been changed, but the change never notified to the public; and in several there had been severe and fatal epidemics of small-pox.

In some unions these notices had been repeated more recently during prevalence of small-pox, as in Romsey, Hereford, Northampton, Alverstoke, Cheltenham, Birmingham, Coventry, &c.; and in several they were put out periodically, or at no very distant intervals, as in Hastings, Rye, Chichester, Westhampnett, Leominster, Ledbury, &c.

and in several, where repeated, were not in accordance with plan pursued.

It is a great inconvenience, which has arisen from the general break down of the vaccinating arrangements of 1853, without the substitution of any other authorised arrangement, that the notices thus put forth are often completely at variance with the plan actually pursued.

Special notices.

Some boards of guardians, when small-pox was prevalent, have published special forms of notice, as in Westhampnett and Bromyard in 1858; and these notices have always had great effect. Some have issued notices threatening prosecution where they have found vaccination specially neglected, as in the unions of Aston, Bromyard, Leominster, and always for the time with considerable result. But these threats, unless followed up, are after awhile disregarded.

Importance of public notifications.

It is of very great importance, and was, I apprehend, the intention of the Legislature, not only that every resident should be correctly informed, or able to ascertain at all times, when and where public vaccination could be procured, but also that the subject of vaccination should be kept before the public eye, as one which had the care and supervision of local authorities. In districts in which vaccination can be carried on from week to week continuously, or at fixed periods,



it is an excellent plan to have the times and places announced in some permanent manner, as by painting them on large boards fixed in different parts of the town, a mode adopted in Marylebone, Paddington, and some of the London parishes. Where it is necessary that vaccination should be carried on by appointment, the most ample means should be used of making public these appointments.

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And in the same way as the Registrar General requires of all registrars to affix some plate or board to the office for registration, so should there be means of indicating every place appointed for public vaccination. This is very generally done in London; but in all the towns I visited I did not in half a dozen instances see any outward sign of a place where vaccination was carried on.

#### 4. Personal Notices and discharge of Registrars' Duties generally.

The duties of the registrars in regard to vaccination consist in the delivery to parents and guardians of children of a personal notice, in form supplied by the Registrar General, of the requirement of vaccination and of the arrangements for public vaccination in the district; and in keeping a register, as directed by the Registrar General, in which the delivery of this notice is minuted, and the certificate of successful vaccination when received is entered.

Registrar's duties.

The *delivery of notice* constitutes a most important part of the Act of 1853, because it is only after this notice that the parent or guardian of a child is liable to the penalties of the Act. The duty of delivering this notice has in some cases been neglected, viz., by the two registrars of Alresford, by the two registrars of Fareham, by the three registrars of Weobly, by the three registrars of Dore, by the registrar of Potterspury, by one of the registrars of South Stoneham, and by one of the registrars of Winchcombe. With these exceptions (already separately reported), the notice had been punctually delivered by the registrars in each union inspected. The minute of delivery was generally made: in some instances, with great regularity; in others, at longer intervals than is desirable, or consistent with the spirit of the instructions of the Registrar General in this respect; in others, the books were greatly in arrear.

Delivery of notice;

keeping of minute-book;

With the notice requiring vaccination to be performed, the registrar is also required to give notice of the days, hours, and places of attendance of the vaccinators. This is a very valuable provision; but in consequence of the change of arrangements in most unions, which had taken place practically but had never been authoritatively sanctioned or announced, the notices thus given were frequently at variance with the arrangement pursued: and instances were brought to my knowledge of persons going to stations according to the notice, and finding that attendance of the vaccinator had been discontinued. Sometimes the registrar, aware that the old arrangement had been abandoned, but not aware what had been substituted, put only the name of the vaccinator, and intimated that on applying to him the people could learn when and where they could have their children vaccinated, an inquiry which in many instances involved a journey of many miles.

Attendances of vaccinators specified on notices often at variance with actual attendances.



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## Registering certificates.

Certificates of successful vaccination had seldom been given by private practitioners, and had not always been regularly given by the public vaccinators. Hence the registers were exceedingly incomplete; and the registrars, whose payment depends wholly on the number of certificates received and entered, had received but a share of the remuneration which the Legislature intended for them.

I have reason to believe that the certificates of the public vaccinators will in future be always punctually given; but the registers can never be made complete until some means be taken for securing the registration of private vaccinations, and the delivery of each certificate not to the registrar of the district in which the vaccination is performed, but to the registrar of the district in which the birth was registered.

Looking at their very scanty remuneration, I have been struck with the careful way in which the registrars' duties have in most instances been performed, and with the very great pains some of them have taken in the matter of vaccination. I have already said, that wherever I have found any approach to the complete vaccination of a district, it has always been with help from the registrar, either by his giving to the public vaccinator lists of children whose vaccination had not been registered, or by himself looking after the cases of neglect. In some instances Registrars have gone further than this. In the Feckenham district of the Alcester Union, in the Milton district of the Hardingstone Union, in one of the districts of Coventry, and in the district of St. Peter's, Birmingham, the registrar had prosecuted cases of neglect: the result of an example thus made being always so well marked for the time, as to put beyond all doubt the complete state of vaccination that might be attained, if the Act of 1853 were fully carried out. The registrar of St. Peter's, Birmingham, informed me that he receives the certificates of most of the private vaccinators, as well as all the public certificates; and that though there are some practitioners from whom he can get no certificates, his registered vaccinations are 80 per cent. of his registered births.

In my communications with the registrars generally, I have found them most ready to give assistance to the public vaccinators. I am satisfied that they have rendered important service to vaccination; and I believe that if they were insured all their certificates, and their fee was slightly increased, they would be, under the local authority, most efficient vaccination officers for carrying out the provisions of an amended Vaccination Act.

Registrars' districts and vaccinating districts being in most instances not co-terminous, a most unfortunate complication has arisen from certain words of the 9th clause of 16 & 17 Vict. c. 100, requiring the notice to be given of the days, hours, and places *within the district of such registrar* at which the medical officer, &c., will attend. This has been taken, for example, to imply, that if a registrar's district comprised parts of three vaccinating districts, as it sometimes does, each of these vaccinators must have a station in the registration district, or his name could not be put on the paper; or, conversely, that if one vaccinating district was situated in three registration districts, there must be a separate station in each. This has been one of the

Important assistance given by registrars to public vaccination.

Provision in clause 9, of 16 & 17 Vict. c. 100, requiring correction.



causes of the subdivision of vaccination in Birmingham; and it has had an equally injurious effect in towns not included in this inspection, but with the arrangements of which I am well acquainted, as Newcastle and Bristol.

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### III.—*Quality of Vaccination, &c.*

WITH the view of ascertaining the kind of vaccination which had been current in the unions visited, I examined carefully the arms of 12,349 children in various national, parochial, and charitable schools, including 397 children in workhouses.

Examination of marks of vaccination presented by children in schools, &c.;

I have already said, that of these, 1,725 were without trace of vaccination mark, and that in 254 more a doubt was possible; 23 had the vaccine crusts on their arms, or were in some stage of vaccination.

Of the remaining 10,344, I have precise notes of the number and character of the cicatrices in 8,256. Of the children first examined (2,088), I have not such notes, having classified them at the time of examination, as best vaccinated, well vaccinated, moderately or passably vaccinated, and badly vaccinated, on considerations derived from the cicatrices, which I will hereafter state.

The *number* of cicatrices in the 8,256 was—three or more in 2,904 cases; one or two in 5,352 cases: total 8,256 cases.

In 1,133 of the children with three or more cicatrices, it was noted that these were—three only in 849 cases; four or more in 284 cases: and in 4,727 of the children with one or two cicatrices, it was noted that these were—one only in 1,615 cases; two in 3,112 cases.

And applying the proportions, as I am certain may be fairly done, to the remaining children, the result will be—four or more cicatrices in 728 cases; three in 2,176 cases; two in 3,461 cases; one in 1,891 cases: total 8,256 cases.

*Quality of Cicatrices.*—I classified the cicatrices as (1) typical, (2) fair or passable, and (3) bad. These terms do not need description: but I may say that I put none in the class bad which were not either very indistinct, or exhibited some striking imperfection of character; and that the class fair, or passable, had a wide range, in some schools shading strongly to the higher, in others to the lower class.

The numbers in each class were—with typical mark or marks, 2,882; with fair and passable mark or marks, 3,485; with bad mark or marks, 1,889: total, 8,256.

And as regards *both number and quality*, there were—

With typical marks, 2,882	-	{	Three or more,	1,036
			Two „	1,219
			One „	627
With passable marks, 3,485	-	{	Three or more,	1,262
			Two „	1,447
			One „	776
With bad marks, 1,889	-	{	Three or more,	606
			One or two,	1,283

In 368 of the 1,036 with three or more typical marks, it was noted that the marks were four or more in 76, and three only in 292. And applying these proportions to the entire number, it would appear that there would be 214 with four or more marks, and 822 with three only.



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In 464 of the 1,262 with three or more passable marks, there were 125 with four or more marks, and 339 with three marks only. And applying these proportions to the entire number, there would be 340 with four or more marks, and 922 with three marks only.

In 291 of the 606 with three or more bad marks, there were four or more marks in 85, and three marks only in 218. And applying these proportions, the numbers would be 173 with four or more marks, and 433 with three only.

In 558 of the 1,283 with one or two bad marks, there were 212 with one only; 346 with two. And applying these proportions, the numbers would be 487 with one mark, and 796 with two.

The general result being,—

With four or more marks, 728	-	{	Typical	214
			Passable	340
			Bad	173
With three marks, 2,176	-	{	Typical	822
			Passable	922
			Bad	433
With two marks, 3,461	-	{	Typical	1,219
			Passable	1,447
			Bad	796
With one mark, 1,891	-	{	Typical	627
			Passable	776
			Bad	487

There are difficulties in the classification by number of cicatrices, arising from the varying size of perfectly normal cicatrices, which I cannot profess to have wholly got over. When a characteristic cicatrix, the result of long incision or large scarification, was double the size of an average cicatrix by puncture, I counted it as two, and so in proportion. But however small a cicatrix might be, it was always reckoned as a unit. Many of the *excessively* small cicatrices, however, were not perfect. But there were great varieties in the size of cicatrices, of perfect character, the results of puncture; I can scarcely conceive that cicatrices thus varying can have precisely the same value; and each division of those with genuine marks must include individuals whom I cannot but look upon as being very variously protected.

Of the imperfect or inferior degree of the protection in every case entered as having bad marks, especially in those having only one or two such marks, and in many of those included among the passable (*e. g.* all with only one such mark), there could be no doubt whatever.

There were 2,088 children, whom I had classified in my notes in the following manner:—

1. Best protected (with more than two typical marks)	-	319
2. Well protected (two typical marks)	- - -	512
3. Moderately protected (two or more passable, or one typical mark)	- - - - -	802
4. Badly protected (bad marks, or only one passable mark)	- - - - -	455
		<hr/> 2,088

And applying the same principle of classification to those of whom I have given the complete details above, the whole result will be—

Best protected	-	-	-	-	-	1,355
Well protected	-	-	-	-	-	1,731
Moderately, fairly or passably protected	-					4,138
Indifferently or badly protected	-					3,120
						<hr/> 10,344 <hr/>

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Differences of number and quality in different unions and districts.

Differences of quality of cicatrices produced by different vaccinators.

Both as regards number and quality of cicatrices, very great differences were found in the various unions and districts. In Gloucester, for instance, of children examined, there were 335 with three or more marks, and 236 with less than three. In Aston Union (Birmingham) there were 260 with three or more, and 270 with less than three. In Alton Union 210 with three or more, and 211 with less than three. While in the unions of Bromyard, Leominster, Weobly, and Ledbury (all in Herefordshire) there were but 38 children who had more than two marks, out of 498 examined; the majority having only one mark. To insert lymph in one or two places only had been the practice in these unions; but it often happened that one or two cicatrices only were found in considerable proportion, where the prevailing practice in vaccinating had been to make three or four insertions.

As to quality, I need not say that the children examined in schools would exhibit generally the work of more than one hand, and in towns especially of many hands; of private as well as of public vaccinators; sometimes of successive public vaccinators. But there were many schools inspected in which the bulk of the vaccination could be ascribed to the public vaccinator, and was often, when he was kind enough to accompany me, as he most frequently did, recognised by him as his work. In some districts this work was of conspicuous excellence, in others the reverse. These districts were sometimes either adjoining unions, or adjoining districts in the same union. And in places where the contrast was not by any means so well marked, there was still a very clear difference between the vaccination of the districts.

In some schools there was the most notable difference in the quality of vaccination in the elder and younger children. Sometimes the one, sometimes the other were the better vaccinated.\*

In the schools of large towns, where the work of many vaccinators was seen together, it was frequently very possible, after a few inquiries at starting, to fit the work to the vaccinator by the kind of cicatrix. "What a difference, sir, between the marks of Mr. L., and Mr. M. and Mr. N.," was the observation made by the mistress of one of the schools in Cheltenham, as I was examining the arms of the

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\* In one of the unions visited, in which there are three districts, the work of vaccination in each being done almost exclusively by the public vaccinator, the marking was found of a very ordinary kind in two of the districts; in one much of it was exceedingly good. Most of the children in a school visited in this district had been done by the predecessor of the present public vaccinator, who used to make two punctures; some by the present public vaccinator, who till recently operated by single puncture. Of the children with two cicatrices, there were, typical 25, fair 16, bad 4; of the children with one cicatrix, typical 7, fair 7, bad 10.



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Mode of vaccinating at present pursued by some of the public vaccinators defective, as to number of vesicles produced.

Disadvantages of dry-lymph vaccination.

children. Some particularly defective vaccination in Shrewsbury, in Gloucester and in other places, was ascribed to medical practitioners, who were not public vaccinators.

How can we explain this difference of marking by different vaccinators? Conversing, as I did most frankly with those vaccinators (when public vaccinators) whose cicatrices appeared to me to be generally of an inferior character, they attributed much to the constitution of the children, and the disturbance of the vesicles. I am far from underrating the influence these circumstances have on the cicatrix; but they are influences which, so far as they operate, will operate equally everywhere, and not occur more in the practice of one vaccinator than another. Surely a difference so marked must depend on the vaccinators themselves, on the lymph they use, and their mode of using it.

In many of the districts visited I found the mode of vaccinating pursued at present by the public vaccinator either of insufficient amount, or otherwise defective. The vaccination "by four or five separate punctures, so as to produce four or five separate good-sized vesicles," has not yet been sufficiently carried out. Of 121 of the vaccinators of whom I had an opportunity of inquiring, there were 39 who said they always made four or more punctures, or small abrasions equivalent to punctures, and six others, whose two large scarifications might be considered equal to four punctures: 16 made "three or four" punctures, 34 made three, 23 made two, and two made one large abrasion or scratch, equal to two punctures: one vaccinator only vaccinated still by single puncture.

I found that some of those vaccinating by four punctures, or by three or four, had only recently adopted that mode, in consequence of the instructions issued, having previously been in the habit of making only one or two punctures.

To most of the vaccinators, the conclusive evidence of the superior value of several vesicles, derived from the records of the Smallpox Hospital, was unknown; and some had feared that sloughing, abscess, and consequences of a singular and dangerous character would be the frequent result of more than two vesicles.\* My communication with them enabling me to lay before them the facts collected by Mr. Marson, which I had had printed in a convenient form, and to explain fully the plan of vaccinating pursued with perfect safety at the large stations of the National Establishment, it was a great pleasure to me to find that the result of the free and ample consideration and discussion of these points resulted always in the assurance that the mode enjoined in the instructions would henceforth be adopted.

The insertion of the lymph, "so as to produce" the requisite number of vesicles, was a point to which we gave great consideration. It was generally said that with liquid lymph, transferred directly from the arm, not only would the vaccination almost always take, but there would be for the most part as many vesicles as there were

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\* Inspection of the arms of children who had been vaccinated by these gentlemen, showed that the vesicles which they had been in the habit of producing, had not been of more than average size.



spots or places in which the lymph was inserted. But in dry lymph vaccination it was far otherwise; often cases failed to take, and the operation had to be repeated, and, if done again in the same way, frequently more than once; scarcely ever did it seem expected that all points of insertion should take. From the defective way in which the registers, with rare exceptions, were kept, neither showing the kind of lymph (whether liquid or dry) used in any vaccination, nor the result of each operation, it is impossible to say in what proportion entire failures took place. The register of one vaccinator, whose common practice it was to use dry lymph, showed 46 failures in 240 vaccinations. Another vaccinator who, during last summer, vaccinated 200 cases, most of them at the people's houses, with recent dry lymph on points, but some of them direct from the arm, said, that he had had altogether between 20 and 30 failures, not one of which had been in the cases done from the arm:\* and most vaccinators, without being able to make any numerical statement, spoke of frequent failures with dry lymph. Success, when attained, was in most instances only partial. A vaccinator, whose habit it was to insert lymph by puncture in six places, told me he seldom got more than one or two vesicles; another, using five punctures, expected generally two or three vesicles; another, operating by abrasion in three places, said he got sometimes three, sometimes two, more often one only; and the testimony was very strong and general that a vesicle could not with confidence be looked for from each puncture or insertion of lymph.

Occasionally I met with vaccinators who, using dry lymph habitually, appeared to have obtained a larger measure of success, who said they seldom failed altogether, and generally produced the number of vesicles they sought.

Even in the hands of the most expert and careful operator, however, the chances of success with dry lymph must, I think it will be admitted, be considerably less than the vaccination from the arm, while infinitely more time and trouble are required.

The period for taking lymph was a subject of inquiry. The day-week (eighth day) was generally well observed. Several vaccinators, however, had adopted it only recently, having previously regarded the ninth day as the proper day. Some still made the ninth their ordinary lymph-taking day. I found that sometimes the eighth, ninth, or tenth day was indiscriminately used; that the amount of areola was not looked upon as an objection if the lymph was not turbid—even might be supposed to increase the activity of the lymph. One vaccinator told me that though he himself did not take lymph later than the tenth day, he knew that it often was so taken, and that the gentleman who supplied him with lymph, when he required any, would even take so late as the 12th day.

I met with many illustrations of the paramount importance of so conducting vaccination as to secure, as far as possible, the success of the operation. Of the elder children in schools, whom I have enumerated among the unvaccinated, there were many who assured me they had been cut, and some of them more than once, and that it would not take; and they seemed to be under the impression that it

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Course pursued by vaccinators as to period for taking lymph.

Importance of so vaccinating that the operation may not require to be repeated.

\* "With good lymph, and the observance of all proper precautions, an expert vaccinator should not fail of success in his attempts to vaccinate above once in 150 times." *Marson.*



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## IV. Local inquiries as to vaccination.

Public vaccination generally performed by contractors in person ;

but, in some instances, delegated to assistants, who had not been admitted as deputies ;

and, in a few, to persons who had no medical qualification.

The registers of the vaccinators

would be of no use vaccinating them any more.\* Some of the children marked with small-pox in the schools said also they had been vaccinated, " but it would not take." Small-pox had been introduced into one village by a child who had been vaccinated three times unsuccessfully. And, on other inquiries, I have met with several cases of death from small-pox in children said to have been vaccinated, but whose vaccination, it appeared, on investigation, had not been successful.

*Deputies.*—The contract of the public vaccinator requires him to perform all his public vaccinations in person, or by some other duly qualified medical man : and by the regulations it is further directed, that the deputy shall have all the qualifications required in a contractor, and that he shall be admitted by the guardians to act as deputy, subject to the approval of the Poor Law Board, to whom the proofs of qualification must be submitted.

In the great majority of districts visited, the work of vaccination was done by the contractors personally. Some contractors, who had qualified assistants, said that they made it a rule to attend to the vaccination themselves, and in cases in which vaccination might casually have been performed by the assistant, they did not fail to inspect the results. Some had delegated their vaccination entirely, or almost entirely, to their assistants, without these assistants having been admitted by the guardians in the manner required, and therefore without the evidence of their qualification in vaccination having been supplied.

The importance of due attention to this regulation is illustrated by the statements made to me, that assistants (qualified in other respects) were sometimes found to be exceedingly ignorant of vaccination.

In some districts, I regret to say, I had evidence, and in others I was led to believe, that the work of vaccination was not only occasionally entrusted, but was frequently delegated, to assistants having no medical qualification whatever. In some others, it was satisfactory to find that such a practice, having existed till recently, had, as I was assured by the vaccinators, been wholly abandoned. Wherever I had proof of its existence, I did not fail to require and receive the assurance of the vaccinators that it should not be continued ; and where there were only general grounds for the belief that it was carried on, I took care that the attention both of the local authorities and vaccinators should be called to the requirements of the Act of Parliament in this respect.†

*Registers.*—It is part of the duty of every public vaccinator to keep a register, in which it is required that every vaccination shall be

\* An experienced vaccinator told me of his having operated with success on children who had been vaccinated three or four times by the deputy of a previous vaccinator, and were reported unsusceptible.

† Habitual employment of assistants as vaccinators is found in many instances to act injuriously on the numerical vaccination of a district. Assistants are often changed, and " people don't like being handed over from one to another." Vaccinators have accounted to me for the bad vaccination of their districts in this way ; they say, " I have no trouble with the people myself, but they won't be done by my assistants."

entered on the day on which it is performed, and that the result of each such operation shall be recorded the succeeding week.

I found the greatest irregularities prevailing in regard to these registers, rendering them in almost all instances, as records of work done, or as scientific records, of little or no value.

In several districts no registers whatever were kept—in the three districts of the Havant Union, in two districts of the Romsey Union, in the Vale district of the Winchcombe Union, in one of the districts of the Potterspury Union, in the parishes of Shrewsbury. In other (numerous) instances, though the entries were made in the prescribed form of book, this was not kept as a *register*, but as an account with the guardians: cases being entered generally once a quarter, sometimes at irregular periods, and even at very long periods, a year or more elapsing without an entry. When the cases were entered, the date of vaccination was usually given; but in some instances the cases were entered in the lump, without dates. And usually only successful cases were entered.\*

In several districts, in which the entries were regularly made at the time of vaccination, the results of operations were not shown; the vaccination, if unsuccessful, being repeated until success was obtained, but without any record to that effect. Cases returned by these vaccinators as not successful, were simply cases which had not been seen a second time. A few registers showed the result of each operation.

Two points of great importance were habitually not noted: 1. There was no record of the kind (whether liquid or dry), or of the source, of lymph employed in any vaccination. 2. There was no distinction between primary vaccinations and re-vaccinations; hence both are confounded in one entry in the column "Above one year of age" of the return made to Parliament.

From the communication I had with the vaccinators, I have every reason to believe that the registers generally will in future be valuable records; but it appears to me quite indispensable that a *better form of register*, and one which calls attention to the points requiring to be noted, should be substituted for that now in use.

#### IV.—*Recommendations, &c.*

THE recommendations which, in certain cases, I gave, according to my instructions, to local authorities in the inspected unions, had reference chiefly (1.) to the maintenance of arrangements for facilitating the vaccination from arm to arm, with such probable average number of cases on each vaccinating occasion as would admit of selection in the continuance of lymph: and (2.) to public notifications in accordance with the plan pursued.

They were necessarily very different in large and populous towns, in smaller towns, and in rural districts.

In every instance before making any recommendations I had the advantage of conferring with the public vaccinators, and generally

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generally imperfectly kept.

Important points not noted.

A better form of register required.

Recommendations to guardians as to arrangements for public vaccination, &c.

\* Many of the vaccinators kept a private book or memorandum, from which they transferred the entries into the public register thus giving themselves double trouble.



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In large towns,

I had their entire concurrence in the recommendations ultimately submitted.

The division of unions for vaccinating purposes, having hitherto been made merely to correspond with the arrangements for the medical relief of the poor, was often not such, especially in the case of large populous towns, as was most conducive to the best vaccination.

Any attempt at an immediate re-construction of districts, however, would have been attended in many instances with considerable difficulties; and, generally, it appeared to me sufficient to lay before guardians for their future guidance the statement of the general principles which should rule vaccinating arrangements, as contained in your Memorandum "On the Subdivision of Public Vaccination, &c." The circumstances of Coventry presented no obstacle to the consolidation at once of the public vaccinations in the hands of one public vaccinator at a conveniently situated central station—an eminently desirable arrangement, which has been carried into effect. A similar recommendation has been given as regards the town of Cheltenham. The re-construction of districts in the Aston Union will be considered immediately after the census has been taken.

In all towns and vaccinating districts in which it seemed practicable to continue vaccination from week to week throughout the year, such concentration of arrangements was recommended as would enable the vaccination to be carried on in the best possible manner. In Birmingham, the stations were reduced to one for each district, (except one, in which an additional station was continued, on account of the larger area of the district,\*) and it was provided that there should be one weekly attendance at each station, and that the public vaccinations of the districts should all be carried on at these stations. Attendance for vaccination, at each of the stations in Portsmouth, on one day only in the week was recommended in substitution for the present arrangement: and recommendations in a similar spirit were given in other places. The attention of guardians was always called strongly to the importance of keeping the public constantly informed of the actual working arrangements for vaccination.

in smaller towns,

In towns of smaller size, as, *e. g.* Chichester, Salisbury, &c., in which the arrangement, presumed to be carried out, of vaccination weekly (or daily, as the case may be) throughout the year is impracticable, the substitution of vaccination at fixed periods (once a quarter) was recommended; each periodical vaccination to be carried on for four weeks, or as long as there were applicants, and public notice to be given at the commencement of each occasion.

in rural districts.

Satisfactory arrangements for the vaccination of rural districts, including villages and towns of the smallest size, were more difficult to devise. The number of births in these districts is not such as to admit of the frequent performance of vaccination with advantage. The plan which found most favour with the vaccinators, and appeared in every way to offer the best conditions of success, was the setting apart two periods of the year (spring and autumn) for carrying on

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\* Distance to be travelled, &c., was never left out of consideration in any recommendations for concentration.

the work of vaccination. The recommendation made was, therefore, in most instances, 1. The maintenance of one station only, the residence of the public vaccinator, as a permanent station for the vaccination, under the best conditions the vaccinator could make, of children who might be brought to him for the purpose. 2. Attendances by appointment, publicly announced, in the respective parishes, or at the established stations, or other convenient places that might be fixed, at two periods of the year, the vaccinations on each occasion being continued for two, three, or four weeks in succession, or as long as there were applicants.

The attention of the local authorities was always particularly called to those districts and parishes in which vaccination had for some time been practically discontinued, with the view of maintaining punctually in future these periodical attendances.

Such further recommendations as were occasionally given to local authorities, and the general purport of the communications I had on other points with the public vaccinators, have, I think, been sufficiently stated in the course of this Report.

### CONCLUSION.

THERE are some considerations and suggestions on the subject of this inquiry to which I deem it my duty to call attention :

1. As it is clearly impossible that the occurrence of severe and fatal epidemics of small-pox can be prevented while such neglect of vaccination as that described in the first part of this Report is permitted to continue, it appears to be a matter of urgent importance that more effectual means should be taken for the extension of vaccination.

2. Local authorities or functionaries should, therefore, be empowered and required to carry into effect the Act of 1853, or an amended Act. It was represented at the time that Act was under consideration of the Legislature, that without such provision it would be partially inoperative.\*

3. By the vaccination of all healthy children within a few months of birth, the work of vaccination will be carried on more regularly, the arm to arm vaccination will thus be better provided for, and the expenses of public vaccination will be fairly divided among the respective unions.

4. It would be a most important check to neglect, if evidence of proper vaccination were required as a condition of admission to any school deriving aid from the public funds. The state of schools, as shown in this Report, appears clearly to indicate the necessity of a regulation of this kind.

5. The difficulties of securing vaccination in rural districts within three months of birth render it desirable that there should be some extension of that period, as regards such districts. Any general extension of that period is much to be deprecated, there being no reason whatever why healthy children in towns should not be vacci-

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\* Report of Epidem. Soc., June 1853.—Parliamentary Paper.



## Appendix.

## IV. Local inquiries as to vaccination.

nated within three months of birth, and every reason why they should.

6. Although it is a very useful provision that registrars shall deliver to parents, on the registration of a birth, notice of the requirement of vaccination, proof of the delivery of such notice should not be necessary as the ground of proceedings. But the most ample means should always be taken by local authorities for diffusing knowledge of the law, and correct information of the arrangements for public vaccination.

7. Each vaccination should be registered by the registrar of the district in which the birth took place, and not of that in which the vaccination was performed.

8. For the completeness of the registers, and for the greater interest of the registrar in the extension of vaccination, means should be taken for securing the due return of *all* certificates of successful vaccination.

9. One certificate of each vaccination delivered to the parent, in the case of a private vaccination, and by him registered, or delivered by the public vaccinator to the registrar in the case of public vaccinations, should suffice, and duplicate certificates should be dispensed with.

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## No. V. STATISTICS of the NATIONAL VACCINE ESTABLISHMENT.

## Appendix.

## 1. Details for the Year 1858.

V. Statistics of  
the National  
Vaccine Estab-  
lishment.

Acting Members of the National Vaccine Establishment.	Stations supplying Lymph for the Public Service.	Number of Vaccinations performed at the Stations.	Number of Charges of Lymph supplied by the Stations.	REMARKS.
I. Vaccinators appointed by the National Vaccine Board, and salaried from the Parlia- mentary Grant -	1. Surrey Chapel -	2,670	45,412	Was discontinued in December. Was discontinued in June.
	2. Battle Bridge -	327	12,002	
	3. Bermondsey -	373	7,412	
	4. Bloomsbury -	355	13,729	
	5. Dean-street, Soho	205	13,609	
	6. Islington (Upper)	90	12,125	
	7. Islington (Lower)	102	7,487	
	8. Kennington -	42	717	
	9. King-street, Port- man-square -	280	10,147	
	10. Paddington -	72	4,036	
	11. Pimlico - -	162	5,668	
	12. Queen's-square, Westminster -	82	7,932	
	13. Russell-place -	832	27,977	
	14. Shoreditch -	153	5,483	
	15. Spital-square -	204	10,928	
	16. Stepney - -	209	41,311	
	17. Wellclose-square -	287	8,175	
TOTAL - {	17 Stations, reduced } during the year to 15 }	6,445	234,150	
II. Parochial and other Vaccina- tors, not appointed or salaried by the National Vaccine Board, but furnish- ing Lymph to the Board at a fixed rate of payment per quantity - -	- None - -	- None -	- None -	See following Tables.
GENERAL TOTAL {	17 Stations, reduced } during the year to 15 }	6,445	234,150	



## Appendix.

V. Statistics of  
the National  
Vaccine Esta-  
blishment.No. V. Statistics of the National Vaccine Establishment—*cont<sup>d</sup>*.

## 2. Details for the Year 1859.

N.B.—The Stations named in *italics* are Educational Vaccinating Stations, authorised under the Order of Privy Council, December 1, 1859.

Acting Members of the National Vaccine Establishment.	Stations supplying Lymph for the Public Service.	Number of Vaccinations performed at the Stations	Number of Charges of Lymph supplied by the Stations.	REMARKS.
I. Vaccinators appointed by the National Vaccine Board, and salaried from the Parlia- mentary Grant -	1. <i>Surrey Chapel</i> -	3,389	72,009	
	2. Battle-bridge -	353	23,902	
	3. Bermondsey -	490	8,693	
	4. Bloomsbury -	372	17,194	
	5. Dean-street, Soho	262	13,186	
	6. Islington (Upper)	24	2,283	Was discontinued in March.
	7. King-street, Port- man-square -	484	10,268	
	8. Paddington -	16	898	- ditto.
	9. Pimlico - -	49	1,684	- ditto.
	10. Queen's-square, Westminster -	25	2,186	- ditto.
	11. Russell-place -	697	12,634	
	12. Shoreditch -	11	453	- ditto.
	13. Spital-square -	246	14,610	
	14. Stepney - -	135	30,060	Was discontinued in December.
	15. <i>Tottenham-court Chapel</i> - -	94	2,752	Began in December.
	16. <i>Wellclose-square</i>	440	8,277	
TOTAL - - {	15 Stations, reduced } during the year to 10 }	7,087	221,089	
II. Parochial and other Vaccina- tors, not appointed or salaried by the National Vaccine Board, but furnish- ing Lymph to the Board at a fixed rate of payment per quantity - -	1. <i>Manchester</i> -	1,139	10,032	Began in March.
	2. <i>Birmingham</i> -	267	663	Began in October.
	3. <i>Bristol</i> - -	62	390	Began in August.
	4. <i>Hull</i> - -	90	1,462	- ditto.
	5. <i>Newcastle-on- Tyne</i> - -	39	430	Began in November
	6. <i>Oxford</i> - -	55	519	Began in July.
	7. <i>Sheffield</i> - -	291	3,216	Began in June.
TOTAL - -	From 0 to 7 Stations	1,943	16,712	
GENERAL TOTAL {	15 Stations, increased } during the year to 17 }	9,030	237,801	

No. V. Statistics of the National Vaccine Establishment—*contd.*

Appendix.

## 3. Details for the Year 1860.

V. Statistics of  
the National  
Vaccine Estab-  
lishment.N.B.—The Stations named in *italics* are Educational Vaccinating Stations, authorized under the Order of Privy Council, December 1, 1859.

Acting Members of the National Vaccine Establishment.	Stations supplying Lymph for the Public Service.	Number of Vaccinations performed at the Stations.	Number of Charges of Lymph supplied by the Stations.	REMARKS.
I. Vaccinators appointed by the National Vaccine Board, and salaried from the Parlia- mentary Grant -	1. <i>Surrey Chapel</i> -	1,630	16,123	Was discontinued in June.
	2. Battle Bridge -	607	12,361	
	3. Bermondsey -	743	9,513	
	4. Bloomsbury -	281	5,294	
	5. Dean-street, Soho	287	5,986	
	6. King-street, Port- man-square -	713	15,674	
	7. Russell-place -	567	4,809	
	8. Spital-square -	293	16,146	
	9. <i>Tottenham-court Chapel</i> - -	1,149	37,530	
	10. <i>Wellclose-square</i>	363	13,154	
TOTAL - - {	10 Stations, reduced } during the year to 9 }	6,633	136,590	
II. Parochial and other Vaccina- tors, not appointed or salaried by the National Vaccine Board, but furnish- ing Lymph to the Board at a fixed rate of payment per quantity - -	1. <i>Manchester</i> -	1,478	9,947	Began in January.  Began in January.      Began in February.
	2. <i>Birmingham</i> -	1,441	9,639	
	3. <i>Bristol</i> - } -	242	2,410	
	4. <i>Hull</i> - -	229	4,904	
	5. <i>Liverpool</i> -	943	26,765	
	6. <i>London</i> (West) -	1,090	none	
	7. <i>Newcastle-on- Tyne</i> - -	418	16,916	
	8. <i>Oxford</i> - -	68	540	
	9. <i>Sheffield</i> - -	514	5,971	
	10. <i>Westminster</i> - -	793	14,665	
TOTAL - - {	7 Stations, increased } during the year to 10 }	7,216	91,757	
GENERAL TOTAL {	7 Stations, increased } during the year to 19 }	13,849	228,347	



## Appendix.

No. V. Statistics of the National Vaccine Establishment—*cont<sup>d</sup>*.

V. Statistics of  
the National  
Vaccine Estab-  
lishment.

## 4. Summary for successive Years, from 1809 to 1860 inclusive.

YEAR.	Number of Vaccinating Stations maintained by Salaries from the Parliamentary Grant.	Number of Vaccinations performed at these Stations.	Number of Charges of Lymph supplied to the Board from all Sources.
1809	8	733	2,580
1810	8	1,493	16,749
1811	9	3,108	23,362
1812	9	3,148	23,794
1813	9	4,521	23,219
1814	9	4,274	25,394
1815	10	4,686	32,190
1816	11	6,581	32,821
1817	11	7,771	44,376
1818	11	9,193	50,043
1819	12	6,289	50,116
1820	12	8,957	51,005
1821	12	6,933	48,105
1822	13	8,229	85,110
1823	13	8,230	—
1824	14	—	—
1825	14	11,354	77,800
1826	14	8,528	98,346
1827	15	8,713	108,635
1828	16	10,263	97,454
1829	15	12,079	100,259
1830	14	11,175	90,681
1831	13	11,326	88,477
1832	13	—	—
1833	13	—	—
1834	13	11,571	83,191
1835	12	—	—
1836	11	—	—
1837	12	—	—
1838	12	18,659	203,818
1839	12	13,144	165,395
1840	12	15,588	160,066
1841	12	15,361	152,668
1842	12	11,105	141,839
1843	12	9,797	158,494
1844	12	13,374	175,362
1845	12	10,167	158,531

No. V. Statistics of the National Vaccine Establishment—*contd.*

## Appendix.

V. Statistics of  
the National  
Vaccine Estab-  
lishment.4. Summary for successive Years, from 1809 to 1860 inclusive—*contd.*

YEAR.	Number of Vaccinating Stations maintained by Salaries from the Parliamentary Grant.	Number of Vaccinations performed at these Stations.	Number of Charges of Lymph supplied to the Board from all Sources.
1846	13	9,774	155,774
1847	12	10,403	168,489
1848	17	11,790	174,991
1849	17	9,089	172,944
1850	17	10,025	179,370
1851	17	11,984	218,632
1852	17	11,219	215,630
1853	17	11,424	319,808
1854	17	9,198	229,532
1855	17	8,657	220,639
1856	17	7,039	210,942
1857	17	6,327	213,207
1858	17, reduced to 15	6,445	234,150
1859	15, reduced to 10	6,978	237,801*
1860	10, reduced to 9	6,653	228,347†

\* Of these 237,801 charges of lymph, 16,712 were contributed by seven parochial and other stations, which, though subsidiary for this purpose to the parent establishment, do not depend for their maintenance on the Parliamentary Grant. The vaccinations performed at these stations during the time of their contributing lymph were 1,943.—*See Table 2.*

† Of these 228,347 charges of lymph, 91,757 were contributed by nine parochial and other stations, which, though subsidiary for this purpose to the parent establishment, do not depend for their maintenance on the Parliamentary Grant. The vaccinations performed at these stations during the time of their contributing lymph were 7,216. The principal of these contributory stations in the year 1860 were the following:—Manchester, whence Mr. Thomas supplied 9,947 charges; Birmingham, whence Mr. Spratly supplied 9,639 charges; Liverpool, whence the Surgeons of the Ladies' Charity supplied 26,765 charges; Sheffield, whence Mr. Atkin supplied 5,971 charges; Westminster, whence Mr. Pearse supplied 14,665 charges; Newcastle-on-Tyne, whence Dr. M'Nay supplied 16,916 charges.  
—*See Table 3.*



## Appendix.

## VI. Excessive mortality from lung-diseases.

## Pottery districts.

Stoke-upon-Trent.  
Wolstanton.

## No. VI.—DR. GREENHOW'S Report on Districts with excessive Mortality from Lung-Diseases.

1. STOKE-UPON-TRENT and WOLSTANTON.—*Manufacture of Earthenware.*

THE registration district of Stoke-upon-Trent and Wolstanton form the well-known Pottery district of Staffordshire, and include the principal earthenware and china manufactories of this country. They stand very high above the sea-level, and the climate is said to be bleak, cold and damp. These districts comprise several small towns and villages, besides the Parliamentary borough of Stoke-upon-Trent. None of these places are densely built, and yet these districts present but very little of the rural character, only about six per cent. of the men having been engaged in the cultivation of the soil at the time of the census of 1851. More than one-third of the men of Stoke-upon-Trent above the age of 20 years, and nearly one-third of those of Wolstanton, were at the same date employed in the Potteries; and more than one-tenth of the men of Stoke-upon-Trent, and nearly one-fifth of those of Wolstanton, worked in the coal and iron-mines. A small number in the latter district were also iron manufacturers. About one-fifth of the women of Stoke-upon-Trent above the age of 20 years, and nearly one-seventh of those of Wolstanton, and an uncertain proportion of boys and girls, and of young people under 20 years of age also at the same date worked in the potteries.

The male inhabitants of Stoke-upon-Trent died from pulmonary affections during the septennial period 1848–54 at the annual average rate of 7·21 per 1,000, and the females at the rate of 6·65 per 1,000. These diseases proved fatal among the males of Wolstanton during the same period at the annual average rate of 7·26, and among the females of 7·27 per 1,000 persons of either sex. The population of both districts increased very largely during the two decennial periods immediately preceding 1851; and, so far as any conclusion can be formed from the annual number of births, marriages and deaths, the previous rate of increase has been nearly, if not quite maintained since that time. Assuming this to have been the case, and using the population for 1857, estimated on this assumption, to calculate the death-rates, this being the middle year of the term comprised in the present inquiry, the mortality from pulmonary diseases in Stoke-upon-Trent during the five years 1855–59 was at the annual average rate of 7·84 per 1,000 males, and 6·17 per 1,000 females; that of Wolstanton at the rate of 7·17 per 1,000 males, and of 7·44 per 1,000 females. These proportions differ so little from the former, that, in consideration of their having been arrived at by means of an estimated population, the two may be regarded as identical. The mortality from pulmonary diseases in Stoke-upon-Trent and Wolstanton is thus very great, and largely exceeds the rate which prevailed during the nine years 1847–55, in any one of three groups of healthy districts in the north, south and south-west of England, which may be considered as showing

the normal rate, and therefore be used as a standard of comparison.\* The difference in the rates of the two districts is in so far remarkable, that while the mortality is greater among the male than among the female population of Stoke, the mortality was greatest among the latter in Wolstanton during the earlier, and equal to that among the males in the later of the periods referred to. The difference is probably ascribable to the larger proportion of children in the population and to the greater number of children's deaths from pulmonary diseases in proportion to the entire mortality from the same, in Wolstanton than in Stoke. The death registers clearly show that the mortality from pulmonary diseases, in both places, has fallen unequally upon different sections of the population. Notwithstanding only 36·6 per cent. of the men of Stoke above the age of 20 years, and 30·4 per cent. of those of Wolstanton, were employed in the potteries in 1851, proportions which have probably not materially varied since that time; more than half, or 438 out of 827 deaths of men over 20 years of age from pulmonary diseases during the five years 1855-59 in Stoke, and 241 out of 615, or nearly two-fifths of those of Wolstanton, were deaths of potters. This class of operatives has therefore suffered

## Appendix.

VI. Excessive mortality from lung-diseases.

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\* Three separate groups of healthy registration districts were selected for the purpose of calculating the standard rate of mortality from certain diseases for England. The first, a Northern group, situated in Northumberland and Cumberland, included the contiguous districts of Glendale, Rothbury, Bellingham, Haltwhistle, Brampton and Longtown: the area of the whole comprises 1,256 square miles, and in 1851 contained a population of 56,637 persons. The second, a Southern group, situated in Surrey and Sussex, comprised the contiguous registration districts of Godstone, Reigate, Dorking, Hambledon, Petworth and Midhurst: it extends over 470 square miles, and in 1851, contained a population of 71,330 persons. The third, a South-western group, situated in the north of Devonshire and Cornwall, included the registration districts of Barnstaple, South Molton, Crediton, Okehampton, Torrington, Bideford, Holsworthy, Stratton, Launceston and Camelford: it includes an area of 1,449 square miles, and its population in 1851 consisted of 183,154 persons. In order to give a sufficiently wide basis to the calculations, they were made to comprehend the nine years 1847-55, these particular years having been selected because 1851, the year of the last census, forms the centre of the term. The subjoined Table shows the average annual rate of mortality per 1,000 persons of either sex from phthisis, from diseases of the respiratory organs, and from the two classed together under the name of pulmonary affections. The paper containing all the results of the investigation is printed in the *Journal of the Statistical Society of London*, for June, 1859, pp. 253-70, under the title, "On a Standard of Public Health for England."

AVERAGE ANNUAL NUMBER of DEATHS from PHTHISIS, Diseases of the RESPIRATORY ORGANS, and PULMONARY AFFECTIONS, in each Group of Districts, to each 1,000 Persons of either Sex, during the Nine Years 1847-55.

Cause of Death.	Six Northern Standard Districts.		Six Southern Standard Districts.		Ten South Western Standard Districts.	
	Male.	Female.	Male.	Female.	Male.	Female.
Phthisis - - - -	2·00	2·29	2·12	2·88	1·95	2·14
Diseases of the respiratory organs (a) - - -	9·7	7·5	1·99	1·66	2·51	1·81
PULMONARY AFFECTIONS (b)	2·97	3·04	4·11	4·54	4·46	3·95

(a) This head comprises laryngitis, bronchitis, pleurisy, pneumonia, asthma, and "diseases of the lungs."

(b) This group consists of the several diseases classed together by the Registrar General under the title of "Diseases of the respiratory organs" and phthisis.



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a much larger mortality from these diseases, in proportion to its number, than the rest of the population, and may therefore be presumed to be exposed to some causes productive of pulmonary disease, from which the rest of the population are exempt. On the other hand, the miners, who formed 10·9 per cent. of the adult male population of Stoke in 1851, and 20 per cent. of that of Wolstanton, contributed only 8 per cent. of the entire mortality from pulmonary diseases among the men over 20 years of age in Stoke, and very little more than 13 per cent. in Wolstanton. In inquiring into the causes of the excessive mortality from pulmonary diseases among the male inhabitants of these districts, the rest of the population may therefore be put out of the question, and attention be exclusively directed to the circumstances connected with the manufacture of earthenware.

The death registers afford no data from which to draw any trustworthy conclusion as to the causes of the excessive mortality from pulmonary diseases among the female population of either Stoke or Wolstanton. Nearly one-fourth, or 19·3 per cent., of the women, aged 20 years and upwards, of Stoke, and 13·9, or nearly one-seventh, of those of Wolstanton, worked in the potteries in 1851. Only 44 out of 602, or about one-fourteenth of the deaths of women aged 20 years and upwards, who died from pulmonary diseases during the five years 1855-59 in Stoke, and only 27 out of 489, or one-eighteenth of those of Wolstanton, are recorded in the death register as those of potters. It may therefore be presumed that the deaths of women are entered in the register under the occupation of their fathers or husbands, and not under that which they had themselves followed.

Notwithstanding that the death register affords no direct evidence with regard to the occupations of the women who have died of pulmonary diseases, it may be inferred, from the large number of women employed in the manufacture of earthenware, and who are exposed to conditions very similar to those of the men, that the high rate of mortality from pulmonary diseases among the female population of Stoke and Wolstanton must be ascribed to their prevalent employment in the staple manufacture of the district.

In considering the causes of the excessive mortality among the potters, the subject will be best arranged under the following heads, viz :—

1. The Habits of the People. 2. The Nature of the Occupation; and, 3. The Influence of the Occupation upon Health.

1. *The Habits of the People.*—The potters of Stoke and Wolstanton are of short stature and sickly appearance. They are said to be of irregular habits, and much addicted to drinking, though, it is added, much less so than formerly. Their dwellings are, on the whole, good and of better size and construction than in many other manufacturing districts. The hours of labour are shorter than in most occupations, work usually commencing at 7 a.m., and ending at 6 p.m., which, allowing the requisite intervals for meals, leaves only 9½ hours of labour per day. Much of the work being paid for by the piece, some of the men work irregularly; but others, who work more steadily, are able to earn a livelihood without labouring the full complement of hours daily. Boys are put to work at a very



early age; at first they help the men, by whom they are paid for their services. Boys were observed carrying recently made ware into the stoves at the age of seven, and at all intermediate ages between seven and fourteen years. Others were employed in making handles for tea-cups, and similar articles, from the age of eight years and upwards. In the larger and better conducted potteries boys are not bound apprentice to the trade until the age of 14, but in smaller and worse managed establishments at an earlier age. Women are largely employed in several departments of the manufacture. Some are "giggerers," that is, they turn the wheel for the potter; others are "treaders" (movers of the lathe for the turners). Some are employed in the warehouse, others in biscuit-scouring, and very many in the ornamental work of painting, gilding, and burnishing. Girls are apprenticed to some of the latter departments, generally at the age of 14 years, occasionally earlier. Young females were seen turning the "gigger" at the ages of 12 and 13 years, and sometimes, but rarely, at an earlier age.

Both men and women marry early in life, and the latter frequently continue to work in the potteries after marriage. The women have the reputation of being bad housewives, and of mismanaging their children, who are often improperly fed during the absence of their mothers. In fact, as usually happens wherever the female population is largely employed in manufactures, the domestic education of the women is deficient, whence results much sickness and great mortality among children. One consequence of this is said to be a manifest deterioration of race. It was stated by Mr. Boothroyd, a medical practitioner at Hanley, that each successive generation of potters becomes more dwarfed and less robust than the preceding one, and that, in his opinion, but for their occasional intermarriage with strangers, this deterioration would proceed even more rapidly. This statement was confirmed by Mr. M'Bean, another medical man, who said that he had observed a marked degeneration in the potters, especially shown in a diminution of stature and breadth, since he commenced practice among them 25 years ago. This falling off he attributed greatly to the neglect of children by their mothers, but more especially to the early age at which children are put to labour, and to the unhealthiness of many of the parents. Some of the evils incidental to a potter's life have, it is said, been aggravated by the circumstance that there is now no cessation of work during the winter. Formerly the potteries were annually closed for some weeks in frosty weather, and this respite from labour afforded the potters time to recover, in some degree, from the diseases engendered by their occupation. Improvements have lately been introduced, which enable the potteries to continue in operation all the year round, and the advantage of the winter's respite is now lost to the operatives.

2. *The Nature of the Occupation.*—The manufacture of earthenware comprises many processes which do not all affect the operatives engaged in them in the same manner, or to a like extent. There is also in some of these processes a material difference as regards their influence on health, according to whether the articles manufactured be of earthenware or china. Indeed, in some of

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the processes, as, for example, in biscuit-rubbing, the quality of the article diminishes or enhances the probability of the process being injurious to the health of the person engaged in it. Of the various departments of the manufacture of earthenware, several require special notice, from the circumstance of their being those to which the prevalence of pulmonary diseases among potters must be ascribed. The operatives employed in these branches of labour may be conveniently named, from the nature of their labour, slip-makers, mould-makers, potters (properly so called), turners, placers, china-scourers, and decorators.

*Slip-makers* are the men employed in preparing the clay, or material of which earthenware is made. After the several substances of which the clay is composed have been ground into a state of fine comminution, they are mixed and diffused in water, so as to form a pappy fluid; this "slip," as it is then called, is evaporated in shallow vats or kilns, wherein it is kept at a boiling temperature, until it has attained the condition of a ductile dough, suitable for the potter's handling. The "slip-kilns" are usually placed in sheds, having openings at the top, to allow the steam to escape; but the temperature of the atmosphere in the sheds is usually high, and the air very moist. Hence the men are exposed to frequent and great vicissitudes of heat and cold in passing and repassing to and from the slip-houses, which are themselves also full of draughts. This description applies more particularly to the preparation of slip for ordinary earthenware; china slip being prepared more slowly, a much lower temperature is maintained in the kilns, and the atmosphere of the houses is therefore much less highly heated and free from steam. A different process is now sometimes employed for the drying of "slip," in which the men are neither exposed to the highly heated moist atmosphere of the ordinary "slip-houses," nor to the trying vicissitudes of heat and cold to which the operatives are subjected in the commoner process just described. Instead of being evaporated in kilns, the slip is permitted to flow into a kind of bag, which is then powerfully compressed, thus squeezing out the water, and converting the slip into clay of the requisite consistency without the aid of heat. This process is not yet in general use, but is said to be slowly superseding the old method.

*Mould-makers* manufacture the plaster of Paris moulds upon which dishes, plates, and many other articles are shaped. A very little dust is evolved in the process, but a considerable quantity is apt to be raised from the floor by locomotion, and mould-makers are, in consequence, liable to inhale air more or less charged with fine dust. Exposure to a high temperature is not a necessary concomitant of the mould-maker's occupation; but some of the men, being of irregular habits, and coming to work late in the day, are obliged to hasten the drying of the moulds by an increase of temperature, and are thus exposed to this additional risk. Some of the mould-makers' shops are lofty and well ventilated, others quite the reverse. Ill-devised modes of ventilation are apt in this, as in other manufacturing processes, to fail in their design. In one of the mould-makers' shops visited, the men suffered from oppression of the chest, cough and expectoration, which they attributed, and no doubt correctly, to the



inhaling of impalpable dust. Yet there was ample provision made for ventilation, which would have much mitigated, if not effectually prevented the annoyance, had it not been for a shelf situated just over the ventilating aperture, deflecting the current of fresh air as it entered. This current of cold air, directed immediately upon the operatives, was an annoyance they could not endure, and therefore they had effectually closed the ventilating apertures. The evils contingent upon this branch of manufacture might be greatly diminished, by more care being taken to avoid scattering the plaster over the floor, and by regularly sweeping the latter, so as to allow as little of the material as possible to accumulate upon it, and be raised into the atmosphere by trampling about.

*Potters.*—Under this name are here included the operatives engaged in the following branches of manufacture: flat-pressers, or dish plate and saucer makers; hollow-ware pressers; throwers, who shape vessels upon the wheel; and sagger-makers, who make the coarse earthenware vessels in which pottery ware is placed for baking.

Flat-pressers roll out a piece of dough, which, when of the proper thickness, they shape upon the mould. The material is used in a wet and ductile state; but bits of it get scattered over the floor, and, rapidly drying, are stirred up by the feet of the boys, who are continually running about the workshop. The atmosphere is thus more or less impregnated with a fine dust, clearly observable only when it lodges on a flat surface, or is seen in the sunshine during a bright day. Articles made by flat-pressers are sent, immediately, to dry in a closet or stove heated by a furnace. These stoves are placed in the workshop, and frequently, especially among plate-makers, close to the operatives, so that the atmosphere in which they work is of an elevated temperature, and very dry. The ware is carried into the stoves by boys, who are very young, and are yet kept running to and fro all day, thereby filling the atmosphere of the shops with dust. The quantity of dust varies according to the cleanliness of the place. Some workshops are swept daily, others only once a week, and of course the operatives employed in the latter are more exposed to inhale dust than those in the former. The temperature of the workshops depends partly upon the sufficiency of the supply of moulds. When the men are well supplied with them, it is not necessary to hasten the process of drying, and the stoves need not be so highly heated. When, on the other hand, there is a deficiency of moulds, the potters endeavour, by way of compensation, to hasten the process of drying, in order that the moulds may again be soon ready for use. Dish-makers are less exposed to heat and dust than plate and saucer-makers, the operations of the former being of slower progress. The stoves, therefore, do not require to be so highly heated, and it is less essential to have them placed near the men. China flat-pressers are less exposed to heat, but quite as much exposed to inhale dust as those who work in the commoner material. China articles are partially dried on a shelf before being placed in the stove, which, therefore, requires neither to be so highly heated, nor to be placed so near to the workman. Saucer-makers create much dust in giving an edge to the saucers after they have been dried in the stove. In

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one instance a flat-presser had constructed a screen between his bench and the stove door, by which means the current of hot air was prevented from blowing directly upon him. This man, after thirty-four years' work, remained perfectly free from potters' asthma. The same object is partially attained at another pottery by so hanging the doors that they open in either direction, and close again spontaneously, as soon as the boys have passed through.

Hollow-ware pressers or "squeezers" are exposed, though in a less degree, to the same influences as the flat-pressers: their work proceeds more slowly, and it is not necessary to place the stove so close to the workman. Both flat and hollow-ware pressers stoop somewhat over their work. Throwers, who shape their work upon a wheel, sit at their employment with the wheel placed directly before them, over which they stoop very much, compressing the chest, and interfering with free respiration. They are exposed to dust from the shaking up of *débris* from the floor, but not to the same high temperature as the flat-pressers. Each thrower has a "giggerer," generally a female, to turn the wheel for him, who is exposed to the same influences as the potter. "Sagger" makers are subject to great vicissitudes of temperature, the saggars being dried in a stove, heated to the temperature of 130° or upwards, into which the men carry them as they are finished.

*Turners* are employed in turning into a complete form the ware formed by the throwers. The atmosphere of the turning shops usually contains a proportion of fine dust, but in smaller quantity than the potters' shops, properly so called. The turner's branch of the manufacture requires no heat, and the shops are accordingly for the most part cooler than those previously described, but are occasionally liable to be over-heated, on account of their proximity to stoves belonging to other departments of the pottery.

"*Placers*" are men who pack the ware in the saggars, and afterwards place them in the oven. Earthenware is surrounded in the saggars with sand, but china with flint powder. In the process of placing the latter in the saggars a considerable quantity of flint dust is said to be sometimes dispersed in the atmosphere. Placers are exposed to a high, oppressive temperature and unwholesome atmosphere in drawing the ovens, that is, in removing the saggars after the ware has been baked. If, however, this be carefully done, the ovens being allowed to cool properly before the saggars are drawn, the danger to health is greatly diminished.

*China scourers* remove the loose flint powder from the china after it has been baked. This is done partly by dusting or brushing, partly by rubbing the china with sand-paper, during which processes much fine flint dust is dispersed into the atmosphere. The fineness of the dust, and its liability to remain suspended in the air, depends upon the quality of the china. In the manufacture of the finer sort, the flint dust is in the form of impalpable powder, that it may not scratch; in that of the inferior sort the flint powder is coarser, and falls to the ground more rapidly. In one of the potteries visited, the china was placed upon a small moveable turn-table, for the purpose of being scrubbed with sand-paper, an



arrangement by which the dust was kept at a greater distance from the mouth of the scourer than when held in the hand. In another pottery the china was being rubbed within the opening of a sort of canvas tube or windsail, up which a draught of air carried a considerable portion of the lighter dust. In most potteries, however, no special precautions are employed to prevent the dispersion of the flint dust into the atmosphere. Biscuit scouring being the most pernicious operation carried on in potteries, the possibility of rubbing the china in a wet state was inquired into, but it was said that this would be impossible, or at least attended with great difficulty, inasmuch as the flint powder, if wet, would adhere to the biscuit, and be very difficult of removal. Flint-powder is not used in the manufacture of the commoner sort of earthenware, which is imbedded in coarse sand, in the sagger, previous to being baked, and does not afterwards require to be scoured.

*Decorators.*—Under this general term are here comprised the persons employed in engraving and printing designs to be afterwards transferred on to the ware, besides painters, gilders and burnishers. All these branches of the manufacture are of a sedentary kind, and are frequently carried on in low ill-ventilated and overcrowded apartments. These places are often over heated, either in consequence of the large fires kept up by the operatives, or because, in certain processes, an oven is required, in order to dry the articles when they have received the design. Several of these are skilled branches of the manufacture, to which an apprenticeship is served, and many married women are found among the journey-women. In the larger establishments there are often a great many persons collected in the work-rooms of these departments, more especially in those in which women or girls are exclusively employed, and this overcrowding, combined with imperfect ventilation, sometimes renders such rooms very unwholesome. Even where, as in the better class of potteries, means of ventilation have been provided, the operatives refuse to make use of them, or actually close them up, in order to exclude currents of air to which pottery operatives, like most others, have a great dislike. This objection might probably be obviated by the adoption of some improved method of ventilation which should provide for a constant renewal of air in the apartment without sensible draught.

Besides the above, there are in potteries several other processes of minor importance which may perhaps exercise an injurious influence on the health of the operatives. Handlers, who make or fix the handles to jugs, tea-cups, and such like articles, are liable to suffer from the heat and dust of the workshops when, as often happens, they are associated at work with operatives of some of the classes already described. Firemen, and the men and boys who carry recently made ware into the hot, or “green” houses, as they are sometimes called, places to which certain articles in a wet state are sent to be dried, are exposed to considerable alternations of temperature. The men who grind the materials for making encaustic tiles, and others who sift the clay, are liable to inhale dust, but these are few in number. “Dippers,” that is, persons who dip the ware in a liquid glaze containing lead, previous to its final baking, are exposed to the danger of lead

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poisoning, which is manifested by the characteristic blue line on the gums, by painter's colic, and by paralysis; but they do not suffer from any form of pulmonary disease in consequence of their occupation. The women employed in laying lustre on to vessels assert that the strong exhalations from the materials used in their work affect the eyes and chest, and the men who blow ornamental rings or bands on to vessels, are said to become liable to asthma. The latter process consists in blowing a liquid composition, from a tin vessel, through a fine tube on to the ware previous to baking.

The size, height, and arrangement of the workshops, and the completeness of the means adopted for ventilation and cleanliness in the several departments, vary much in different potteries. Some establishments are very inferior to others in all these respects; and several, which possessed excellent arrangements in some respects, were deficient in others. It was stated that the workshops are now kept at a lower temperature than formerly, a change which has proved highly beneficial to the workmen; but it is very possible that much good might still be effected by adopting a better method of ventilation; by improving the arrangements as regards the situation of the drying stoves in relation to the workmen; and, above all, by more effectually removing the *débris* from the floor, which is certainly a principal cause of the dust suspended in the atmosphere in many pottery workshops. In some establishments the floors are swept daily, generally in the morning, a practice open to this objection, that the dust raised in the process has not time to settle again before the people commence work; but in most of the inferior potteries the floors are not swept oftener than once a week, probably seldom so often.

3. *The Influence of the Occupation on Health.*—The several processes of manufacture just described directly or indirectly exercise an injurious influence on the health of the operatives in various ways: such as the respiration of air more or less charged with fine irritating dust; exposure to a dry, hot atmosphere, or to a hot, moist atmosphere, or to great vicissitudes of temperature; or the habitually assuming a constrained attitude while at work.

China scourers are in general exposed to only the first of these influences, and theirs is the most pernicious branch of the manufacture. The fine flint dust diffused through the air of the workshop, and inhaled into the lungs, very soon produces discomfort, and a sense of oppression in the chest, soon followed by dyspnœa, cough, and expectoration. The scourers very often have hæmoptysis, and sometimes suffer from epistaxis. China scouring is performed by women, few of whom continue very long at the occupation. The danger to health varies according to the quality of the china; the scouring of the better kinds, owing to the greater fineness of the flint dust used in the manufacture, being an employment more injurious to health than the scouring of the commoner sorts. Out of 12 china scourers employed in one of the first establishments at Stoke-upon-Trent, only one had worked so long as three years at this branch of the business; but another, who had worked five years, had lately left. The foreman



of this pottery said that china scourers who continue at the occupation never fail to become asthmatical\* sooner or later. In another pottery, at Hanley, where an inferior sort of china is manufactured, a scourer who had worked eight years, and was suffering from chronic bronchitis, said, that four other scourers who were employed in the same room had died from the effect of the occupation since she had commenced it, and that a fifth was then at the point of death. In a third pottery a woman who had worked ten years at the occupation, asserted, that about 12 other scourers in the same shop had died since she entered it. Out of 13 china scourers, belonging to six or seven different potteries, whose evidence was taken, only four were in good health; nine were suffering in consequence of their occupation. Of the latter, three were suffering from an advanced stage of chronic bronchitis, attended by great difficulty of breathing; four had suffered from hæmoptysis, and the others all had more or less shortness of breath, cough, and expectoration. The eldest of these women was 50 years of age, two were over 40, and four were under 30 years of age. One of the latter was among those whose health had given way under the employment. China scourers are very liable to attacks of catarrh, which rarely fail to aggravate and hasten the progress of their disease. Those who relinquish the employment in time are said occasionally to regain perfect health, but the greater number become irretrievably damaged in health. Probably this branch of the manufacture might be rendered much less injurious to the health of the workers if some arrangement could be adopted for withdrawing the dust from the atmosphere, or, perhaps, the use of some kind of protection for the mouth, such as a respirator, might serve to exclude the dust from the air passages.

Potters, including under this term flat and hollow ware pressers and throwers, handlers, turners, and mould makers, all suffer, but in a different degree, from inhaling air impregnated with impalpable dust. Flat pressers suffer most, turners and mould makers least from this cause: the former because they are compelled to work very closely in order to earn a maintenance, and their work being rapidly done, the boys who help them are continually running backwards and forwards to the stoves, thus raising the dust from the floor; the latter comparatively but little, because there is less of locomotion in their workshops, and therefore less dust in the atmosphere. Flat pressers are also exposed to another influence, productive of bronchial irritation, in the respiration of highly dried hot air caused by the stoves in their workshops. In this, as in other noxious occupations, the potters would often appear to resist the deleterious influence of their calling for some years, and then break down about middle age. It was stated by several of the medical men, by some of the foremen, and by the potters themselves, that the latter, as a class, rarely attain the age of 50 years, and are scarcely ever able to work after their 45th year. This, however, is clearly an error, as the deaths of potters at a much more advanced age appear in the death registers,

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\* The terms asthma and asthmatical are commonly used by miners, grinders, flax-dressers, potters, and other operatives who suffer from difficulty of breathing or cough in consequence of their occupation; they are, therefore, employed here and elsewhere throughout the paper in this ordinary, but not in their pathological sense.



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and flat pressers were observed at work at the respective ages of 62, 56, and 53 years. Out of thirty-one flat pressers over 25 years of age who were questioned, four were under 30 years of age, seven between 30 and 40, fifteen between 40 and 50, and five over 50 years of age. Out of eleven hollow-ware pressers, one had reached the age of 72 years, and two were aged 66 and 60 years respectively. Out of the eleven, two were more than 25 and under 30, three between 30 and 40, one between 40 and 50, two over 50, and the above three over 60 years of age. Out of twelve turners, one was aged 61 years, three were between 30 and 40 years, five between 40 and 50 years, and three above 50 years of age. The oldest mould-maker seen was only 50 years of age, but others were reported to be much older.

Out of 37 flat pressers, taken indiscriminately in several potteries, 20 suffered habitually from bronchial irritation (or potter's asthma, as it is termed); and only 17, most of them younger men, declared themselves to be healthy. Out of 16 hollow-ware pressers, eight only considered themselves healthy; the others were all suffering, more or less, from dyspnœa and cough. Out of 14 turners, only four, and out of six mould makers, only two, were asthmatical.

The evils incidental to these branches of the potter's calling might unquestionably be mitigated by increased cleanliness and improved ventilation, and by the adoption of such arrangements as would tend to moderate the heat of the workshops. The simple contrivance of placing a screen between the flat-pressers and their stoves, or even the hanging the doors of the latter in such a manner that they would close of themselves as the boys passed in and out, would not be entirely without benefit. Throwers suffer partly from the diffusion of impalpable dust through the atmosphere of their workshops, but, in their own opinion, still more from stooping over their work, thereby compressing the chest, and obstructing respiration. The men differ much as regards stooping, some leaning more over their work than others. The above influences, sooner or later, affect most of the throwers, and some of them rather early in life. Out of seven throwers, notes of whose evidence were taken, the oldest was 54, the youngest 27 years of age; and five declared themselves to be asthmatical.

Slip-makers suffer from the relaxing influence of the hot moist atmosphere, and the vicissitudes of temperature to which they are so much exposed. They are said to be much addicted to drinking, and are very prone to catarrhal affections, which at length terminate in chronic bronchitis. Out of five slip-makers who were examined, the oldest was 41 years of age, and four were suffering more or less in health from the circumstances attendant upon their occupation. The injurious influence on health of slip-making might be effectually obviated by the employment of pressure, instead of heat, for drying the slip.

The principal disease from which the several classes of pottery operatives suffer, in consequence of the unhealthy influences to which they are exposed from the nature of their calling, is chronic bronchitis. Doubtless these influences promote the development of phthisis in those who are predisposed to that disease; but, with this exception, potter's asthma is essentially a form of bronchial irritation which commences with a sense of oppression at the chest, followed by dyspnœa, cough,



and expectoration, in the order in which they are here mentioned. Dyspnœa often precedes cough for some time, and the cough is, for the most part, at first nearly dry, though potters in general habitually raise a little phlegm even when not otherwise indisposed. Hæmoptysis appears to be common only among the china scourers, a circumstance which somewhat confirms the opinion expressed by Mr. Boothroyd, that their ailments are of a more acute nature than those of other pottery operatives. There can also be no doubt, from evidence obtained in this inquiry, that the china scourers suffer in health sooner and break down more rapidly than any other class of workers in the potteries.

It is quite possible, as supposed by the medical men, that the cold, bleak situation of the pottery districts may perhaps increase the ailments of potters, there being no doubt that acute catarrhal attacks supervening upon chronic irritation of the bronchial mucous membrane, have a tendency to aggravate that disease.

The numerous persons employed in the various decorative departments of the earthenware manufacture suffer from no causes of ill health so intimately connected with the nature of their work as those to which potters are exposed. The one cause of pulmonary disease to which the decorators are more particularly exposed is the close, ill-ventilated and often over-heated state of their work-rooms. No direct evidence of the influence of these evils upon health could be obtained in the pottery districts. Several operatives were examined who suffered from cough or hæmoptysis, and many were reported to have broken down in health, and either to have died of phthisis, or to have withdrawn from the occupation, but the evidence was insufficient to connect the failure of health with their employment; notwithstanding this, there can be no doubt that the condition of many of the rooms in which the china decorators work are such as are likely to injure health, and especially to produce pulmonary disease. There could be no great difficulty in effectually remedying the evils of these workshops. A greater amount of space and freer ventilation (care being, of course, taken to exclude draughts) would completely remove the chief causes of ill health, without at all interfering with the efficiency of the workers.

## 2. BROMSGROVE, ALCESTER and SHEFFIELD.—

### *Metal Manufactures.*

THE manufacture of metal, chiefly of iron, in one form or another, constitutes the staple occupation of the inhabitants of Bromsgrove, Alcester and Sheffield; but the three districts differ much in character and in the nature of their manufactures.

The registration district of Bromsgrove comprises the sub-districts of Bromsgrove, Belbroughton and Tardebigg. The sub-district of Bromsgrove includes the town of that name, which contained a population of 4,426 persons in 1851. The inhabitants are chiefly employed in nail-making, a domestic manufacture carried on in little shops attached to the cottages. There are also salt works at Stoke Prior, in which the inhabitants of the immediate neighbourhood are employed. Belbroughton is chiefly an agricultural district, but a

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few of its inhabitants are employed in the manufacture of nails and of scythes. Tardebigg includes the rapidly increasing town of Redditch, which was not sufficiently large to be reckoned as a town by the Census Commissioners of 1851; the manufacture of needles here forms the staple employment of the inhabitants; but there is also a considerable population employed in the cultivation of the soil. Neither Bromsgrove nor Redditch is a densely built town; the former contains several confined courts, and cottages are sometimes found erected back to back, so as to prevent thorough ventilation; but the dwellings of the working classes are, upon the whole, of a fair character.

Less than one-third, or 27·5 per cent. of the men of Bromsgrove, above the age of 20 years, were employed in the cultivation of the soil, and 30 per cent. in the manufacture of nails and needles when the census was taken in 1851; of these, 22·6 per cent. were nail-makers, and 7·4 per cent. needle-makers. The proportion of persons employed in the manufacture of needles, which is almost exclusively confined to the Tardebigg sub-district, has probably much increased since the last census, Redditch having now become the principal centre of the manufacture. Women and children are largely employed both in nail-making and needle-making. In 1851, 14·2 per cent. of the women, aged 20 years and upwards, were nail-makers, and 7·2 per cent. needle-makers, the latter being almost entirely resident in the sub-district of Tardebigg, the former chiefly in that of Bromsgrove. Many children of both sexes are employed both in nail and needle-making; but there are no data from which to calculate the proportion they bear to the number of children of their respective ages among the entire population.

The male inhabitants of Bromsgrove died from pulmonary affections at the average annual rate of 5·83, and the female at the rate of 5·59 per 1,000 of either sex during the septennial period 1848-54. The population increased about 11 per cent. between the years 1841 and 1851, the largest increase being in the sub-district of Tardebigg. Supposing this rate of increase to have been maintained since 1851, the mortality from pulmonary diseases during the five years 1855-59 has been at the annual average rate of 5·43 per 1,000 males, and of 5·37 per 1,000 females. These rates indicate a slight improvement in the public health of the district as regards the mortality from pulmonary diseases; and as improvements have been effected in some of the processes of needle-making, which are likely to diminish one principal cause of pulmonary disease, it is quite possible that such an amendment may have really taken place. Considering, however, that the calculations have been made by the aid of an estimated population, and that the decrease is very small, the rate of mortality may be regarded as having been nearly the same in the two periods. The deaths have not been equally distributed among the several sub-districts in proportion to the number of their inhabitants. In the sub-district of Bromsgrove the mortality from pulmonary diseases during the last five years has been at the annual average rate of 4·86 per 1,000 males, and of 4·80 per 1,000 females; in that of Tardebigg it has been at the rate of 6·33 per 1,000 males, and of 6·72 per 1,000 females. The mortality of Bromsgrove has, therefore,

but slightly exceeded the rate which prevails in the two healthy standard districts in the South and South West of England,\* whilst that of Tardebigg, considering the almost total absence of urban influences, has been high.

The rate of death from pulmonary diseases in Bromsgrove and its sub-districts is contrasted with the standard rates just referred to in the subjoined Table :—

AVERAGE ANNUAL NUMBER OF DEATHS FROM PULMONARY DISEASES in the Registration District of *Bromsgrove*, in the Sub districts of *Bromsgrove* and *Tardebigg*, and in the South-western and Southern Standard Districts to each 1,000 Persons of either Sex.

Name of District.	Per 1,000 Males.	Per 1,000 Females.
Bromsgrove Registration District - - -	5.43	5.37
<i>Bromsgrove Sub-district</i> - - - -	4.86	4.80
<i>Tardebigg Sub-district</i> - - - -	6.33	6.72
Ten Standard Districts in Devonshire and Cornwall - - - - -	4.46	3.95
Six Standard Districts in Surrey and Sussex -	4.11	4.54

The registration district of Alcester includes the little town of Alcester, which contained 2,027 persons in 1851. The population is chiefly agricultural, 40.8 per cent. of the men aged 20 years and upwards having been employed in the cultivation of the soil in 1851. Needles are made both in the town of Alcester and in other parts of the district, and the manufacture, at the last census, afforded employment to 16 per cent. of the men, and to 13 per cent. of the women, above the age of 20 years, besides an uncertain proportion of young people and children of either sex. The male inhabitants of Alcester died from pulmonary diseases at the annual average rate of 5.59 and the female at that of 5.77 per 1,000, persons of either sex during the septennial period 1848-54. The population of Alcester increased very little during the ten years previous to the last census, and has probably been almost stationary since that time. Assuming it to have been stationary, the mortality from pulmonary diseases during the five years 1854-59 has been at the annual average rate of 5.04 per 1,000 males, and of 5.30 per 1,000 females. These figures again, as in the case of Bromsgrove, show a small decrease of mortality, but so slight that the rates may be regarded as being the same both in the earlier and later period. Considering the rural character of the district, these rates must be deemed excessive, seeing that they exceed the normal rate by at least 1 in the 1,000 in either sex.

The mortality in the Bromsgrove sub-district having only slightly exceeded the normal rate, little needs to be said on the subject of the prevailing occupation, which presents nothing necessarily injurious

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\* For an account of these standard districts, see the foot note on p. 103.



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to health. Nail-making is carried on in the immediate neighbourhood of the cottages; the shops, though small and sometimes crowded, admit the air freely through open windows: each shop, on the average, contains four or five "stalls" or stands for making nails, a single fire serving for four or five workers, as well as for one. Children generally commence nail-making at the age of ten, sometimes as early as that of nine years. The men work irregularly; idling away the earlier part of the week, they work excessively hard towards the close, when, as their occupation can be carried on as well by night as by day, they often begin at 3 or 4 o'clock in the morning, and continue at work till late at night. As children can only work when the fire is lit, they also are compelled to work at the same unseasonable hours. Notwithstanding this, the mortality from pulmonary diseases in the sub-district of Bromsgrove does not appear to be aggravated either by these irregular hours of labour or by the free exposure to the open air, arising from the construction of the workshops. The men employed in the salt works at Stoke do not exceed 100 in number; they are exposed to inhale a hot moist atmosphere from working in the evaporating houses, and to great alternations of temperature while conveying the blocks of salt into the drying stoves.

The high rate of mortality from pulmonary diseases in the sub-district of Tardebigg is considered by the medical practitioners of Redditch as not entirely due to the prevailing occupation of the people. Dr. Nicholson says these diseases are prevalent among the entire population of the neighbourhood, and Mr. Smith that strumous diseases are very common. When the latter practitioner first settled in Redditch, 20 years since, the place was smaller than it is at present, and marriages of consanguinity were frequent. The effect of this custom, he adds, is still manifest in the frequent recurrence of the same names among the inhabitants. There is, however, no doubt that the prevalence of pulmonary disease is chiefly attributable to circumstances connected with the staple occupation of the inhabitants.

The manufacture of needles and fish-hooks being the chief occupation of the inhabitants, both of Tardebigg, in the registration district of Bromsgrove, and of the greater part of the registration district of Alcester, the two places may be considered together. The manufacture comprises several processes. Some of these are injurious to the health of the operatives, but not all in a like degree, or in the same manner. Needle-pointers suffer from inhaling dust, and from their position while at work. Needle-polishers and filers also, it is believed, suffer from inhaling dust evolved during their labour. Some of the operatives, such as "needle straighteners" and "hardeners," are exposed to a high temperature; but no positive evidence could be obtained that their health suffers therefrom. Many women and children employed in different departments of the manufacture leading a sedentary life, and often working in ill-ventilated places during at least ten hours of the day, are exposed to influences which other inquiries have shown to be prejudicial to health, and which are perhaps more particularly apt to produce diseases of the lungs. The air of the warehouses must be kept dry, and hence it happens that these are often over-heated, rendering both



the employers and their workpeople, who pass much time in these rooms, very liable to catarrhal affections. The same remark may be applied to pin-makers, a few of whom are found in Redditch.

Needle-pointers grind the needles on a dry grindstone; these stones are moved by water-power, and the shops in which the pointers work are in general freely open to the air. This was designedly done in former times with the intention of blowing away the dust created in the process of grinding, and the men were hence much exposed to the inclemency of the weather, and liable to suffer from catarrh. Dust is very copiously given off both in the process of grinding and in that of preparing the stones. The latter process is not of daily occurrence, a stone lasting from a fortnight to two or three months, according to the nature of the work; but during the process, which consists in smoothing the grinding surface of the stone, by the aid of a steel bar, the grinding shops are filled with clouds of dust. Whilst preparing the stone, some of the men cover the mouth with a handkerchief, or adopt some similar precaution against inhaling the dust. Much fine dust is evolved during the process of needle-pointing. It consists of fine particles of steel and stone, and unless some means be employed for preventing its dispersion into the air, it is liable to be inhaled by the workman. Formerly the methods adopted for this purpose were very imperfect; now "fans," as they are termed, are in common use, the stone being partly surrounded by a wooden casing communicating with a shaft into which a current of air is drawn by a circular fan, revolving in a close compartment at the further end. By this means, the dust which comes within reach of the current of air, is drawn into the shaft, and there deposited. No difference of opinion exists either among the grinders or their employers as to the great benefit which has resulted from the employment of these fans. Both Dr. Nicholson and Mr. Smith of Redditch, and also Mr. Morris of Studley, who have had very extensive practice among the needle manufacturers and pointers, agree in opinion that the introduction of the fan has greatly tended to lessen the frequency of "needle-pointers' asthma." Indeed this disease has now become comparatively rare. Even men who, having worked for some years in the earlier part of their lives without the protection of a fan had suffered in consequence of inhaling dust, have partly regained their health since the use of fans became general. Formerly needle-pointers are said to have rarely worked continuously at their employment for ten years without serious injury to health from inhaling the dust. Many died before reaching the age of 35 years; and though there were occasional exceptions, but few escaped a premature death from the disease engendered by their occupation. Needle-pointers were formerly very intemperate in their habits, a circumstance which doubtless aggravated their ailments, and tended to shorten their lives; but of late years there is said to have been a manifest improvement among this class of men with respect to sobriety and steadiness.

Although the introduction of fans has produced such beneficial effects, the occupation of needle-pointing is still attended with injury to health. A small quantity of fine dust, only perceptible when the sun shines brightly, escapes the indraught of air produced by the fan,

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and the pointers still sit at work, leaning forward towards the stone. Some of the men attributed their liability to suffer from the occupation mainly to the latter circumstance.

It is impossible to calculate the rate of mortality among needle-pointers, seeing that, though the number of men employed in this department of the manufacture is small, it is not accurately known. The proprietor of one of the largest needle manufactories employs from 600 to 700 persons, only 18 or 19 of whom are pointers. This class altogether contributes but a small quota to the list of deaths from pulmonary disease, only 16 deaths from this cause being recorded in the death registers of Alcester and Bromsgrove during the last five years as those of needle-pointers; but it is probable that this number does not exactly represent the real amount of mortality, seeing that men sometimes leave the occupation, and turn to some other branch of labour. The ages at death of the 16 needle-pointers were as follows:—viz., two between 20 and 30, seven between 30 and 40, five between 40 and 50, and two between 50 and 60 years of age, the youngest being 20, the oldest only 54 years of age. Out of 14 needle-pointers, most of them over 30 years of age, whose evidence was taken during the inquiry, 11 were suffering more or less severely from pulmonary disease, which they attributed to causes connected with their occupation. The youngest of these was 19, the oldest 58 years of age, and 10 of the others were between 30 and 50 years of age. One of them, a man aged 47, who had worked for 17 years as a pointer, was suffering so much from dyspnoea, that he was compelled to ride to and from his place of work, and yet he continued to labour for five or six hours a day. The pointer aged 58 years had worked at the calling for nearly half a century; and another, who declared himself to be in good health, had been a needle pointer for 30 years.

Fish-hooks, like needles, are ground on dry stones. The process is identical in both, and the men are called pointers indiscriminately, whether their occupation be the sharpening of needles or of fish-hooks. Needles, after being pointed, are polished in the manufactory, a little dust being given off in the process, and most of the polishers are said to suffer, sooner or later, from the occupation. The employment is of a sedentary nature, and is often carried on in over-heated, ill-ventilated workshops. Several polishers labouring under bronchitis were seen, who attributed their ailments to the nature of their occupation.

That the high rate of mortality from pulmonary diseases in Tardebigg is really to be ascribed to the employment of the people in needle-making may be assumed from the fact, that whilst out of 109 deaths of men over 20 years of age from pulmonary diseases in Bromsgrove and Belbroughton, only 23 were those of nail-makers; 35 out of 74 deaths of men of the same age from pulmonary disease in Tardebigg were those of needle-makers. It is true the numbers are small; but, seeing that, on the one hand, needle-makers constituted a smaller proportion of the population of Tardebigg in 1851 than did nail-makers of that of Bromsgrove and Belbroughton, whilst, on the other hand, the deaths of needle-makers from pulmonary diseases during the last five years amounted to nearly half the mortality produced by these diseases in Tardebigg, and those of nail-makers



to less than one-fourth of the deaths from the same cause in Bromsgrove and Belbroughton, the conclusion appears inevitable, that the higher rate of mortality in Tardebigg than in the remainder of the registration district arises from the greater mortality among needle-makers.

About one-sixth of the adult male population of Alcester in 1851 were employed in the manufacture of needles. This proportion has probably decreased since that time, yet one-fourth of the deaths, from pulmonary diseases, of men over the age of 20 years during the last five years have been those of needle-makers. Here, again, the numbers are small, but, as they lead to the same conclusion as in the case of Tardebigg, the two facts may be regarded as establishing the connection between the high rate of mortality from pulmonary diseases in these districts and the occupation of needle-making. The deaths of sixty-six male needle-makers occurred at the following ages; viz., twenty-one between 20 and 30, nineteen between 30 and 40, twelve between 40 and 50, seven between 50 and 60, and seven over 60 years of age.

Doubtless the conditions to which needle-makers are exposed promote the development of phthisis in such as are predisposed to that complaint; but the disease most generally produced by the occupation is chronic bronchitis, though perhaps sometimes, as was stated by Dr. Nicholson, it may be sub-acute pneumonia. Of the few cases that could be examined, one was unquestionably a case of phthisis, which would probably have occurred irrespective of the man's occupation. Others were cases of chronic bronchitis, unaccompanied by any unusual features. In two others, which may be considered as typical cases of needle-pointers' disease, there was deficiency of resonance on percussion in all parts, but especially in the posterior and inferior regions of the chest. In both men the chest was well formed, and free from flattening in the infra-clavicular regions; but in the worst of the two the upper part of the chest expanded imperfectly in respiration. In both men the natural murmur of respiration was more or less changed into a coarse, sonorous, and sometimes almost tubular sound. In the most advanced case there was obscure crepitation in the apex of the right, and evident signs of consolidation in that of the left lung. This man was aged 47 years, and had occasionally suffered from hæmoptysis. The pulse in both cases was perfectly quiet, and there was neither hectic nor marked emaciation. Even the worse of the two was able to follow his employment for a few hours daily, though the difficulty of breathing was so great, that he was incapable of active locomotion. Both these men dated the commencement of their illness to attacks of catarrh. One of them had previously followed the occupation of needle-pointing for ten years, without serious injury to health: the other, after twice suffering severely from pointers' disease, discontinued needle-pointing, and became a labourer in a garden. He then improved very much in health; but, finding his earnings insufficient, he had returned to his former employment, and was suffering from its effects at the time of the present inquiry.

Sheffield differs from Bromsgrove and Alcester not only in being a large town, but also in the great variety of occupations followed

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by its inhabitants. The district is almost exclusively urban, a very small proportion of the men, scarcely exceeding 3 per cent., having been employed in the cultivation of the soil in 1851. The manufacture of metals forms the staple employment of the people; but it comprises many branches, and several other manufactures, such as crinoline, hair-seating, buttons, combs, optical instruments, and flax, are more or less extensively carried on in the town. Sheffield is best known for its cutlery, including knives, forks, scissors, razors, and edge-tools under that denomination; but the manufacture of other articles in metal, as of gold and silver, Britannia metal, electroplated and plated goods, of railway springs, saws, scythes, files, stoves, grates, fenders and fire-irons, likewise employ a considerable number of hands. Data do not exist for correctly estimating the proportion of persons employed in each of these branches of industry; but about 37 per cent. of the men above 20 years of age were employed in the staple iron and steel manufactures of the town in 1851. Very few women are returned in the report of the last census as being employed in iron and cutlery work, but many find occupation in other branches of local industry, such as the manufacture of Britannia metal, crinoline, buttons, combs and hair-seating.

The mortality from pulmonary diseases among the inhabitants of Sheffield during the seven years 1848-54 was at the average annual rate of 8.39 per 1,000 males, and of 6.70 per 1,000 females. The population increased very much during the 10 years preceding the last census, and has probably gone on increasing quite as rapidly since that time. Assuming it to have increased at the same rate, the mortality from pulmonary diseases during the five years 1854-59 has been at the average annual rate of 9.11 per 1,000 males and of 7.95 per 1,000 females. If, as is very possible, the increase of population has been even greater than is here supposed, these figures would represent too high a rate of mortality; but it may at least be presumed that the rate of mortality among males has not decreased since the earlier calculation was made, whilst that of females has rather increased, a circumstance probably explicable, if the facts could be correctly ascertained, by the greater number of females now employed in several branches of manufacture. It would be impossible, amid so great a variety of occupations, to apportion to each one its due share in the causation of pulmonary diseases; but the circumstances most likely to produce these diseases, to which the working classes of Sheffield are exposed, may be comprised under three heads:—

1. The liability to inhale Dust. 2. The maintenance of a constrained position while at work. 3. Working in ill-ventilated Work-places.

The first of these is the most efficient cause of pulmonary disease among the operatives of Sheffield, and also that which is most capable of proof. The influence of the other two is rather to be inferred from the results of observation in other districts than demonstrated by any definite facts collected in Sheffield. Both, however, undoubtedly exist, and were referred to by the operatives themselves, or by the medical men, as among the causes of the prevalence of pulmonary disease.



1. The liability to inhale an atmosphere more or less charged with dust is common to the operatives employed in several of the manufacturing processes of Sheffield, such as the grinders of cutlery or other steel goods, the cutters and polishers of bone and ivory handles, the polishers of combs, the converters of iron into steel, the hacklers of Mexican fibre, and the sorters of hair. Of these several classes the grinders are probably the most numerous, and are unquestionably those whose health is most liable to be injured by their occupation. Their work consists in grinding the edge of knives, razors, scissors, tools, and other articles of cutlery, the points of forks, and the "bolster" or rounded part near the handle of table-knives, the shanks of scissors, the backs of razors, and such like articles. They are called, according to the articles which they grind, razor, fork, knife, scissor, saw, scythe, or file grinders, and may be conveniently classified as dry, wet, or mixed grinders, according to whether they grind exclusively upon a dry or wet, or sometimes upon a dry, sometimes upon a wet grindstone.

To whichever of these classes the grinder may belong, he is exposed to the danger of inhaling air loaded with fine dust, both while "razing," *i. e.* preparing, and hacking the grindstone. The former of these processes is in general only required when fresh stones are being hung, and the operation consists in bringing the stone, while revolving on its axis, into shape, and to the requisite evenness, by means of a bar of steel. Clouds of dust are formed during the process, and fill the atmosphere of the workshop. Stones wear out quickly or slowly, according to the nature of the articles ground upon them, some lasting for five or six months, others wearing out in the same number of weeks. Hence the frequency of the grinder's exposure to this cause of a dusty atmosphere varies much according to the nature of his employment. Grindstones commonly require to be hacked daily, sometimes twice or thrice in the day. This process consists in roughing the grinding surface with a pick-axe. The stones are both "razed" and "hacked" while in a dry state; and, excepting that some of the more prudent workmen cover the mouth with a handkerchief, to prevent their inhaling the dust, no precaution is used to guard against the danger to health arising from this cause.

Dry grinders use the dry stone only, and large quantities of fine dust, composed partly of steel, partly of sandstone, are produced during the act of grinding. These men formerly adopted no precaution against inhaling the dust, which they are apt to do very freely, seeing that they sit directly behind, and, as it were, astride the stone, in order that they may be close to their work. Some still continue to work in the old manner, without protection; but the greater number now use a fan, similar to that used by the needle-pointers, which draws the dust into a shaft, and very greatly diminishes the liability of the grinders to suffer from this cause of pulmonary disease. The value of the fan was fully exhibited in some of the fork-grinders' shops, where streams of sparks, as the red-hot particles given off from the friction of the stone and steel appear to be, were observed suddenly to turn downwards into the shaft as they came within the influence of the indraught of air.

After being ground, the articles are finely polished, or, as it is

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called, "glazed," upon a wooden wheel, coated with a paste containing emery. Dust is evolved in this process likewise, but much less abundantly than in dry-grinding. The same men sometimes do both kinds of work, but more frequently the grinders have apprentices, or hire journeymen, to glaze the articles when ground. The principal articles ground on the dry stone are forks, razor backs, the "bolsters" of knives, the rounded parts of scissors, gimlets, augers, and various other tools; the bright rounded portions of fenders, fire-irons and stove-grates, and spindles and flyers for spinning-mills. In grinding the smaller articles the men sit behind their work, towards which they lean, but in grinding larger articles they sometimes stand. A factory at Leeds was visited, where spindles and flyers are ground, and where the stones are placed at such a height as enables the men to stand conveniently at their work, and are so well screened, that, aided by a powerful fan, the operatives are effectually protected from the dust. By working in a standing position, they also avoid the stooping posture maintained by the Sheffield grinders, which is supposed to be one cause of their tendency to suffer from pulmonary disease. It is found to be difficult to screen the grindstone so effectually in grinding large unwieldy articles, such as fenders or fire-irons; and, as the fan does not work well unless the stone is partly encompassed by a screen, the men employed in grinding such articles are more exposed to the evils arising from their occupation than other dry grinders.

Wet grinders work entirely upon a stone which, revolving in a trough of water, is kept constantly wet while at work. They are exposed to the same influence as other grinders while razing and hacking the stones, and, like them, also stoop much while at work. Wet grinders are exposed to damp, and are liable to get wet in the legs and feet. The grinders assert that the use of the wet stone does not entirely prevent the evolution of dust, but that a small quantity of very fine dust, only perceptible in bright sunshine, is given off into the atmosphere. The edges of cutlery and edge tools, scythes, saws and files, are ground upon wet stones. Mixed grinders work partly upon a wet, partly upon a dry grindstone. A considerable difference exists in the proportion of time spent by mixed grinders in the respective processes of wet or dry grinding, which varies according to the nature of the articles ground.

The grindstones were formerly worked by water-power, and the workshops, or "wheels," as they are called, were, for the most part, situated in rural places, by the sides of the streams which turned the wheel. Scythes are still ground by water-power; but as trade increased, and the necessity for more grinding-wheels arose, it became requisite to employ steam-power, which is now in general use for turning the stones in all the principal grinding wheels. This change has been attended with several disadvantages as respects the health of the operatives. The grinders formerly, for the most part, resided in the country, often at some distance from their wheels, so that many of them had the advantage of walking several miles daily in a pure atmosphere to and from their labour; they now reside in Sheffield; and whereas formerly there were many times when, on account of the scarcity of water, they could not work, they are now able to work



continuously, and have thereby lost the benefit to health derived from these frequent intervals of cessation from labour. At a still earlier period the same operatives who forged and hafted the blades, also ground them, and then the disease, now so well known as grinders' asthma, was entirely unknown.

It would be difficult to estimate correctly the rate of mortality from pulmonary diseases among the Sheffield grinders; only 250 men above 20 years of age are set down as grinders in the Census Report of 1851, but the real number is much greater. Dr. Holland estimated them at 3,000 in 1843, and Dr. Hall, a recent writer on their diseases, estimated them at 3,110 in the year 1857. If the latter number be correct, the mortality among them from pulmonary diseases during the five years 1855-59 was at the annual average rate of 13 per 1,000, a rate which nearly corresponds with that among the men of the lead-mining districts, is considerably higher than that among the men of the principal manufacturing towns, and is more than double the rate which has prevailed in any one of three extensive rural areas in different parts of the kingdom, which may be used as standard or normal rates.\* These figures, however, only serve to show that this class of operatives die in a very large proportion from these diseases, and they must by no means be regarded as indicative of the exact rate of mortality. The most conclusive evidence of the deleterious influence of this occupation on health, obtained during the inquiry, is afforded by the fact, that out of 46 grinders who were questioned while at work, 21 were more or less affected with pulmonary disease, and only 25 declared themselves to be in perfect health. Men belonging to each of the three classes of dry, wet and mixed grinders, were comprised among the 46, but the majority were mixed grinders.

The Sheffield grinders are said to break down in health at an early age. One of the most intelligent among them said that he did not believe there was a grinder at work in the town who had passed his 40th year; and another affirmed, what is nearer the truth, that the greater number become ill before attaining that age. A like statement was made by other persons of the same class, and indeed such seems to be the general impression in the district; facts, however, do not entirely confirm this belief: one man belonging to the class of mixed grinders who had paid into a club continuously for 30 years, had not once during that long period had occasion to make any claim upon its funds on account of sickness. In one "wheel," where fifty men and boys are employed, there were, one man aged 61 years still at work, two aged 58, one aged 54, and five or six aged 50 years, or thereabouts. Out of eight fork-grinders in another establishment, one man, who had been a grinder from boyhood, was said to be 61 years of age; and yet fork-grinding is the most injurious branch of the business. Out of forty-four other grinders whose ages were ascertained while actually at work, ten were between 20 and 30 years of age, eight between 30 and 40, thirteen between 40 and 50, six between 50 and 60, and seven over 60 years of age.

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\* For a more particular account of the standard rates, see p. 53.



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It should be stated, however, that the ages of the younger men and boys were rarely inquired into, seeing that all attempts to estimate the healthfulness of any particular class of operatives by merely ascertaining the average age of the living would be exceedingly futile.

The disease from which the grinders suffer, and which is called by themselves "grinders' asthma," though it cannot properly be called asthma, is similar to that of certain kinds of miners, china-scourers, and flax-dressers. The earliest symptoms are those of bronchial irritation, which is very liable to be aggravated by catarrh, and also by the various unhealthy influences, such as intemperance, irregular hours, and unhealthy dwellings, to which the grinders are exposed. At first there is oppression at the chest, followed by dyspnoea, cough and expectoration; these often go on slowly, and almost unobserved by the men themselves, until an attack of catarrh occurs, when the chronic ailment becomes much aggravated; hence it is that the grinders often assign a cold as the cause of their illness, though in reality they had been for some time previously suffering from slight chronic affection of the bronchial membrane. But few grinders, it is said, work continuously for many years without suffering more or less from their occupation. Bronchitis in grinders is apt, after a time, to be complicated with solidification of the lungs, manifested by a greater or less amount of dulness of the chest on percussion, and this, eventually, is said to terminate in disorganisation of the lungs. It was found very difficult to obtain the opportunity of examining patients, though the medical men, especially Dr. Elam, physician to the Infirmary, and Dr. Hall, physician to the Public Hospital and Dispensary, afforded every facility in their power. Of the several patients examined, two or three were labouring under phthisis, the accession of which might perhaps have been hastened by their occupation; but in other respects their cases presented no unusual features. Several were suffering from chronic bronchitis, and others, in a more advanced stage of the disease, afforded, on examination, evidence of consolidation of the lungs. The cases examined were not sufficiently numerous to determine the frequency of the latter condition, and the only patients who, on examination, afforded evidence of the existence of cavities in the lungs, were young men under 30 years of age. None of the patients appeared to labour under emphysema.

Although the grinders form the most numerous class of operatives in Sheffield who suffer from pulmonary disease in consequence of dust evolved whilst following their occupation, and afford the most unequivocal evidence of the relation between their ailments and the unhealthy influences to which they are exposed, there are others, subject to similar influences, though in a less degree, who are said to suffer in a like manner. Operatives who cut and polish bone and ivory handles for cutlery work in a dusty atmosphere. A fan is occasionally used in the polishing department to carry away the dust, but it appeared to be less efficacious than in the grinding "wheels." These people also suffer from bronchitis in consequence of inhaling dust. One man, suffering from this cause, was seen in the infirmary; and of five others who were examined, two were



suffering from bronchial disease, which they attributed to their occupation.

“Converters,” *i. e.* the men employed in works where iron is converted into steel, are liable to inhale the dust of charcoal while, placing it in alternate layers with iron bars, in the converting furnaces; the same men afterwards, at the conclusion of the process, draw the steel from the furnace, during which they are much exposed to inhale dust and carbonic acid gas, and also frequently to a highly heated atmosphere. To prevent themselves inhaling dust during the latter process, converters are accustomed to cover the mouth and nose with a wet sponge. These men are liable to oppression at the chest and dyspnœa if they continue long at the employment, which few men, it is said, can follow for more than eight or nine years, and most of them turn to other departments of labour as soon as they begin to feel injured by their occupation. A man who had worked for seven years as a converter, in one of the principal factories of this kind, said he had worked longer than any one else in the place. Out of five converters who worked in the same factory, three habitually suffered from cough and difficulty of breathing.

The above comprise the principal branches of the cutlery and iron manufactures of Sheffield, in which the workpeople are exposed to inhale dust. The operatives employed in grinding smooth the rough blocks of horn and gutta percha used for the manufacture of combs, also work in a dusty atmosphere; but as they rarely grind longer than two or three hours in the day, they do not suffer from their occupation so much as might be expected. Notwithstanding this fact, out of five of these operatives seen at work, two were complaining of oppression in the chest, which they attributed to their employment. A fan had been recently introduced into the workshop, which had materially lessened the amount of dust in the air, and one man, of middle age, who had previously suffered from cough and expectoration, said his health was so much improved that he is here included among the three in sound health.

The women employed in sorting and hackling hair and Mexican fibre are much exposed to dust. The number of women employed in this branch of business is small, and they form but a small section of the entire number employed in hair-seating manufactories. In a factory where 500 women and girls were employed, only about 30 were hacklers. Few of these were seen at work, but five of those were suffering more or less from cough and shortness of breath, the effects of inhaling dust. The foreman of the sorting department said that he himself was subject to cough, produced by his occupation, and that many of the women likewise suffered from the same cause.

2. The maintenance of a constrained position while at work. This has already been mentioned as in all probability an auxiliary cause of grinders' disease. A stooping posture is maintained during their hours of labour by several other classes of operatives, more particularly by the file-cutters, who sit all day long at benches leaning over their work. These form a numerous class, file-making being an important branch of the manufactures of Sheffield. File-cutters are a sallow, sickly-looking set of workpeople, and, besides suffering

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from the sedentary nature of their employment, which is sometimes carried on in unwholesome, overcrowded workshops, are liable to suffer from lead poisoning, the files being cut on blocks of lead. Women and boys, as well as men, are employed in this branch of work.

3. Working in ill-ventilated workshops is frequent in Sheffield. File-cutters often work in such places; so also do many of the women and girls employed in warehouses, in comb-making, and in the other branches of manufacture in which female labour is used.

The facts already recited abundantly prove that several of the manufacturing processes of Sheffield are largely productive of pulmonary disease. This remark applies especially to the grinders; but the death registers also clearly show, that the staple manufactures of the town are a principal cause of the high rate of mortality of its inhabitants from this class of diseases. Although in 1851 only 37 per cent. of the adult men were employed in these manufactures, nearly half the males over 20 years of age who died from pulmonary diseases during the last five years, were either grinders, cutlers, file-cutters, or operators employed in some other branch of iron manufacture. Even among these the mortality was unequally distributed; for whilst, according to the last census, cutlers, grinders and file-makers formed scarcely one-half of the workers in iron, they have contributed rather more than three-fourths of the deaths of workers in iron over 20 years of age from pulmonary disease during the last five years.

### 3. PENZANCE and REDRUTH.—*Tin and Copper Mining.*

Mining dis-  
tricts.

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Redruth.

PENZANCE and Redruth are, the former almost exclusively, a tin, the latter a copper mining district. Redruth may be considered as a purely mining district, scarcely more than one-tenth of the adult male population having been employed in the cultivation of the soil, whilst more than a half were copper or tin miners when the census of 1851 was taken. About six and a half per cent. of the adult female population were at the same date employed in connexion with the mines. The registration district of Redruth comprises the towns of Camborne and Redruth, neither of which is densely built, though the former contained in 1851 a population of 6,547, and the latter of 7,095 persons.

Rather less than one-third of the adult population of Penzance were engaged in mining pursuits in 1851; one-fifth were engaged in cultivating the soil, and about one-eighth in maritime occupations, especially in the fisheries. Besides the town of Penzance, which in 1851 contained rather less than 10,000 persons, the registration district includes the small borough of St. Ives, picturesquely situated on the north coast at the entrance of St. Ives bay and the little town of St. Just, not ranked as a town by the Census Commissioners.

Pulmonary affections produced an average annual mortality in Redruth at the rate of 6·70 per 1,000 males and 4·50 per 1,000 females, and in Penzance at the rate of 5·60 per 1,000 males, and of 4·56 per 1,000 females, during the septennial period 1848–54. The rate of mortality in females during the period in question was,



therefore, very nearly identical in both districts; and whilst it agreed very exactly with the normal rate which prevailed during the nine years 1847-55 in the six healthy standard districts of Surrey and Sussex, but little exceeded that of the ten healthy standard districts in Cornwall and Devon.\* On the other hand, the rate of death among males considerably exceeded the normal rate in both these districts, and was considerably higher in Redruth than in Penzance.

The moderate rate of mortality among the female population of these places appears to show that neither the soil nor the climate or social position of the people tends especially to the production of pulmonary disease, the prevalence of which among the male population must arise from some cause which does not affect the females. That this cause is the employment of so large a proportion of the men in mining appears quite certain, an opinion which derives confirmation from the circumstance that the mortality from pulmonary diseases is much larger, in proportion to their numbers, among the male population of Redruth, a larger proportion of whom are employed in mining, than among those of Penzance. That the larger proportion of the men employed in mining in Redruth is really the cause of the greater mortality from pulmonary diseases among the male population of that district is rendered still more evident by an examination of the statistics of death from these diseases among the adult population. The rate of mortality among the women of Redruth at the time to which these calculations refer, did not differ much from that which prevailed among the women of the already mentioned healthy standard district in that neighbourhood, the proportions being 4·81 per 1,000 women, aged 20 years and upwards, in Redruth, and 4·63 in the South western standard district. On the other hand, the rate of mortality among the men aged 20 years and upwards was 9·50 per 1,000 in Redruth and 5·70 in the standard district, the males of which probably die in a larger proportion from these diseases than they otherwise would do in consequence of some of them being employed in quarrying and manufactures. Thus, very evidently, the men of Redruth are exposed to influences productive of pulmonary disease which the women escape. The men work in the mines under ground, while the women employed about the mines work among the ore at the surface, an occupation attended by much exposure to the weather, but apparently not productive of pulmonary disease; though it is said by some of the medical practitioners of the neighbourhood that the women are very liable to anæmia, amenorrhœa and dysmenorrhœa.

The population of both Penzance and Redruth has been in a very changeful state during the last few years. Many miners, especially those in early manhood, have either migrated to other districts in consequence of mines ceasing to be worked, or have emigrated to foreign countries. One of the managers of a large mine said that more than half of their best hands had gone abroad about six or seven years since, leaving only very young or very elderly men to carry on the mining work. The average annual number of births,

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\* For an account of the standard rates, see the foot note on p. 103.



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marriages and deaths has been smaller, both in Penzance and Redruth, during the years 1855, 1856, 1857, and 1858, than during the immediately preceding five years; the decrease being greatest in Penzance. It is thus probable that the population of Redruth remains nearly what it was in 1851, whilst that of Penzance has somewhat decreased; but it is quite impossible to estimate correctly the number of the population of either district at any date subsequent to the last census. It has, therefore, been necessary for the purpose of calculating the rate of mortality from pulmonary diseases during the last five years, to assume that the population has remained stationary since 1851; and though the results thus obtained can only be regarded as approximating to the truth, they at least serve to show the comparative rate of mortality in the sexes. It appears, from this calculation, that the rate of mortality from pulmonary diseases in Penzance has decreased from 5·60 per 1,000 males, and 4·56 per 1,000 females, during the seven years 1848-54, to 4·88 per 1,000 males, and 4·20 per 1,000 females, during the five years 1855-59. But, as it is certain that the population has undergone great changes, that it has probably decreased in numbers, and that the number of young children has certainly diminished, it may be safely presumed that the rate of mortality during the last five years has been much the same as it was during the earlier period. On the other hand, the rate of mortality from pulmonary diseases in Redruth has increased slightly in both sexes: it was 6·70 per 1,000 males, and 4·50 per 1,000 females, during the seven years 1848-54, and has been 6·85 per 1,000 males, and 5·10 per 1,000 females, during the five years 1855-59. The mortality of the male part of the population, therefore, continues in excess in both districts, and it is important to note that the excess has been largest in the mining portions of each district.

There is still greater difficulty in estimating correctly the population of the sub-districts than that of the districts. The proportions calculated on the assumption that the population of each of the sub-districts has remained stationary, would therefore not be trustworthy. Such calculations, however, no doubt afford nearly a correct view of the relative mortality of the sexes; and, to avoid quoting doubtful figures, the death-rate of females from pulmonary diseases in each sub-district being considered as 100, that of males would be 141 in the sub-district of St. Just, where the men are nearly all miners; 134 in Uny-Lelant; only 125 in the sub-district of Penzance, where a large proportion of the men are employed in other occupations than mining; and 105 in that of St. Ives, where a large number of the men are engaged in fishing, and other sea-faring pursuits. In Redruth, which is a much more exclusively mining district than Penzance, the death-rate of females from pulmonary diseases still being reckoned at 100, that of males is 128 in the sub-district, where the mortality of males is lowest, and 148 where it is highest.

An examination of the death registers proves that the unusual pressure of pulmonary diseases among the male population of Penzance and Redruth falls chiefly upon miners; but the same changeable condition of the population which renders it so difficult to calculate the rate of mortality with ordinary precision, renders it



also equally difficult to obtain any accurate statistical evidence of the extent to which mining contributes to aggravate the mortality from this class of diseases. A most praiseworthy and laborious attempt has indeed been made by Mr. Couch, an eminent medical practitioner, resident in Penzance, to determine this by means of data derived from the death registers; and that gentleman has satisfactorily shown that a much larger proportion of the entire mortality is produced by pulmonary diseases among the miners than among the rest of the population of Penzance. Mr. Couch has also endeavoured to demonstrate the pressure of the unwholesome influence of their labour upon the health of miners, by ascertaining their average age at death. Neither of these modes of investigation, however, really adds any precise information to the fact, previously well known in the mining districts, that miners are peculiarly prone to pulmonary diseases, and are, on that account, shorter lived than the rest of the community. Indeed any attempt to estimate the health of a population by ascertaining the average age at death is apt to be exceedingly fallacious, seeing that the average age at death must depend greatly on the greater or less proportion of persons of different ages of which a population consists. The average age at death, for example, among the boys at Christ's Hospital, or of any similar establishment, would be very low, though, perhaps, the rate of mortality might be remarkably small; on the other hand, the average age at death among the pensioners of Greenwich or Chelsea Hospital would be high, though possibly the rate of death—that is to say, the proportion of deaths to the number of the living might be very high. These, it may be said, are extreme illustrations; but they serve, at least, to show the fallacy which must attach to such calculations, when the ages of the living are not taken into the account, which is impossible in so changeable population as that of Penzance and Redruth.

The facts relating to the influence of tin and copper mining upon health elicited by the local inquiry, will be best arranged under the following heads, viz :—

1. The Nature of the Occupation.    2. The Habits of the Miners.
3. The Influence of the Occupation upon Health.

1. *The Nature of the Occupation.*—Both tin and copper mines are often at a great depth below the surface, and are usually entered by means of perpendicular shafts. The Botallack Tin Mine, near St. Just, for example, is 180 fathoms in depth, and the United Consols Mine, at Gwennap, in the district of Redruth, 280 fathoms in depth; the latter being 45 fathoms below the “adit,” or public level maintained at the joint expense of the several mines for the purpose of carrying off the water. Mines have sometimes only a single shaft, but more generally there are two, and the larger mines frequently have several. The Providence Mine, in the district of Uny-Lelant, has three shafts, and some others have even more. Where there are more shafts than one, some of them will serve as “downcast,” and others as “upcast” shafts; but there is no such methodical arrangement for the ventilation of the Cornish mines as is in use in the northern coal mines,

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and the same shaft acts alternately as a "downcast" or "upcast" shaft, according to the state of the mine, the direction of the wind, or the condition of the weather. The miners pass up and down the shaft by means of perpendicular ladders, up which the younger men often run very rapidly. The ascent of these ladders is very fatiguing, and as it is made at the conclusion of the day's labour, it is very toilsome, and is by many persons considered, though probably on insufficient grounds, as one cause of the miner's great liability to pulmonary diseases. A considerable time is occupied in ascending from the mines, varying, of course, according to their depth, but probably, on the average, an hour is daily employed in this process on the conclusion of the miner's proper day's work. Within the last few years a contrivance called a man-engine has been introduced in some of the deeper mines, which saves the miners much of the fatigue caused by ascending from the mine, but it is as yet only in partial use.

Levels are driven from the shafts in various directions, at different depths from the surface; and "winzes," or communicating shafts, are driven between parallel levels, to promote the circulation of air, and facilitate communication between one part of the mine and another. The levels are commonly six feet in height by three in breadth; but where the ventilation is difficult, or the air impure, they are sometimes excavated eight or nine feet in height, the excess over six feet being partitioned off from the rest by an air-tight floor, so as to divide the level into two parallel compartments, through one of which an inward current of air finds its way, and an outward current through the other. The same object is sometimes attained by carrying a pipe along the level, by means of which a current of pure air is conveyed into the mine, the foul air returning through the level. Some of the mines near the sea coast, such as the Levant and Botallack Mines, near St. Just, penetrate a considerable distance beneath the ocean, thereby rendering free ventilation even more difficult. The ventilation of the Botallack Mine, which passes to a distance of half-a-mile under the sea, was so imperfect, that a diagonal shaft, for conveying fresh air into the mine, has been sunk at an angle of  $32\frac{1}{2}$  degrees from the surface, to the extreme point of the several principal levels. The mine has by this means been rendered much purer as regards its atmosphere, and likewise much cooler. Previous to the construction of this diagonal shaft, candles would scarcely burn in some parts of the mine, and the temperature stood at about  $87^{\circ}$ . In mines which do not pass beneath the ocean, shafts are sometimes made from the surface to the upper levels for the admission of pure air, which finds its way into the lower levels by the "winzes"; but it is probable that these shafts are less numerous than could be wished. Air is also sometimes conveyed into the mines by means of wind-sails, or is forced in by means of fans or other artificial contrivances, but these are not in common use. Indeed, though it was stated both by the captains and managers of the mines, by the miners themselves, and also by some of the medical practitioners most conversant with mining, that the mines have been much better ventilated during the few last years, it was almost universally allowed that the ventilation of many of the Cornish mines is



still very imperfect. The degree of ventilation not only varies much in different mines, but likewise in different parts of the same mine. The "fast-ends," or *culs-de-sac*, in which the levels terminate, and "winzes," at least while in process of excavation, are those parts of a mine in which the air is most impure, and in them it is sometimes so impure, that candles will only burn in it when held horizontally. Hence the ventilation in new mines, not yet in full working order, is always more deficient than in such as are in full operation.

The temperature is high in the Cornish mines, especially in the copper, which are hotter than the tin mines, even though of the same depth. The temperature in the United Consols Mine at Gwennap was said to be as high as 125°, and the men can only work by short spells, and are constantly supplied with cold water for drinking, which soon becoming hot in the warm atmosphere of the mine, is sent down from above at very brief intervals. Steam was coming out of the shaft in volumes at the time of inspection, and the temperature of the hut at the top, in which evidence was obtained from some of the older miners, was sensibly affected by the warm air rising out of the mine.

The mines are chiefly worked by blasting, in which process the air is both partly exhausted by the burning of gunpowder, and also charged with smoke and other products of combustion, which for some time after the explosion taint the atmosphere of the mine, rendering it unsuitable for respiration. Mines vary much in this respect, the smoke lingering longer in such as are dry, but being absorbed by water in the moister mines. Dust, sometimes containing arsenic, is made in drilling the shot-holes; hence, in some of the drier mines, the liability to inhale air more or less charged with dust is said to be one of the evils to which the miners are exposed.

2. *The Habits of the Miners.*—The Cornish miners are naturally a fine, tall, well-grown race of men, very superior in appearance to the lead-miners of the north of England; but they are usually sallow and pale, and very subject to dyspepsia, as well as to the ailments which form the special subject of this paper. Their cottages are said to be of an inferior description, and sometimes unwholesome; but such of them as were visited in the course of the present inquiry at St. Just, and other places in the district of Penzance, were by no means strikingly deficient in point of either construction or comfort. They were for the most part cleanly, and though some had concrete floors, the latter were dry, and the cottages themselves not devoid of comfort. The miners often combine agriculture with their other occupation, and cultivate small portions of land during their leisure hours. Boys commence working at an early age among the ore at the surface of the mine; formerly they worked under ground from the tender age of 10 years, but of late years have not been set to work in the mine until they have attained the age of 12 years. Miners work in detachments called "cores," one core going into the mine as another quits it. In some mines there are but two cores a day, one of which, called the forenoon core, descends into the mine at about 7 a.m., and, discontinuing work at 1 p.m., reaches the surface at half past two or three o'clock: the other, or afternoon core, which relieves the former, descends at 2 p.m., and "comes

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to grass," as it is termed, at about 9 p.m. In other mines there is a night core, besides these day cores. Some of the miners reside at a distance from the mines, to and from which they walk daily. Formerly the miners often worked in damp clothing, which was a fruitful cause of catarrhal affections, and contributed greatly to aggravate the complaints induced by the other conditions of their employment. Now most, if not all, the mines are provided with a shed or house well warmed by the steam boilers, in which the men keep and dry their mining clothes, so that they now go into the mines in dry, instead of wet clothing, and again change their wet garments when they come from work; the drying-houses are occasionally at some distance from the shaft, and the men, arriving heated and wet from the mine, are said to be apt to take cold from exposure to the lower temperature of the external atmosphere before they can change their clothes.

All the miners do not come under the same category as regards exposure to the deleterious conditions incidental to the occupation of mining. One class of men, called "tutmen," are chiefly employed in driving forward the levels, sinking or rising "winzes," and doing other work appointed them by the captain of the mine. Another class, called "tributers," select their own "pitches," and often refuse to work where the ventilation is imperfect; these latter rarely, if ever, work by night, and though they suffer eventually from working in the unwholesome atmosphere of the mine, they yet do so at a later period of life, and less severely, than the "tutmen."

3. *The Influence of the Occupation on Health.*—The habitual respiration by the miners of the close impure atmosphere of the mines during about a third part of the 24 hours, produces bronchial irritation at an early age; at first, indeed, it may be for some years, the irritation is so slight, that the men themselves scarcely regard it. Hoarseness and wheezing are among the earliest symptoms of "miners' consumption," as the complaint is called, for which the men apply for relief to their medical attendants. These early symptoms are locally called a "hisk," and are characterised by a tone of voice very like that which is often observed in persons recovering from diphtheria. Sooner or later dyspnœa sets in, and is, after a time, attended by more or less of cough and expectoration. The men, indeed, assert that expectoration is not an early symptom of their ailment, and it certainly does not become copious until after they have suffered for some time from dyspnœa, hoarseness and cough, but most of the miners habitually have slight expectoration long before they become seriously indisposed; this expectoration arises from the irritation caused by the inhalation of soot or dust, and is either black or coloured, according to the predominance in the atmosphere of the mine of soot or of dust arising from the material that is being excavated. Thus, in certain mines the expectoration of the miners is red, or rusty coloured, from admixture with dust coloured by soil containing the oxide of iron.

Although some diversity of opinion prevailed among the medical practitioners of the mining districts as to the precise nature of miners' consumption, they yet all agreed in saying that, sooner or later, nearly every person who works continuously in a mine for many years



suffers from some form of pulmonary disease. The time of life at which the miners begin to suffer severely from their employment varies greatly according to the character of the mines in which they work, the nature of their employment, and their personal habits and constitution; other things being equal, men who work in an ill-ventilated mine break down in health sooner than those who are employed in mines of a better kind. The "tribute-men," for the most part, suffer less severely, and later in life, than the "tutmen." Delicate persons of course suffer sooner than the robust; and an opinion prevails among some of the miners that men who, residing at a distance of a mile or two from their place of work, have occasion to walk to and from their daily labour, or who combine agricultural work with mining, succumb more tardily to the deleterious concomitants of their calling than those whose dwellings, being contiguous to the mine, do not require to take active exercise in the open air. This opinion was less frequently expressed among the Cornish miners than among the lead-miners of the north of England; but it tallies so exactly with what was said by the latter, that the two statements may perhaps be considered as confirming one another, more particularly, seeing that the hurtful influences are similar in both kinds of mines.

Catarrhal attacks, to which many of the miners are very prone, on account of the delicate and irritable condition of the mucous membrane of the air passages, and of their exposure to great alternations of temperature, frequently cause an aggravation of the miners' disease. This is well illustrated by the history of some miners, mentioned by Mr. Couch, who, having worked for a time in a very hot and imperfectly ventilated mine, became so dissatisfied with the state of the mine, that they transferred their labours to a better ventilated and cooler mine in the same neighbourhood. Soon afterwards they began to suffer severely from working in a temperature much lower than that to which they had been accustomed, and many of them broke down in health, and died in a brief space of time after their removal to what they regarded as a better field of labour. Indeed the correctness of Mr. Couch's statement was fully confirmed by the account of themselves given by several superannuated miners, who traced the commencement of their ill-health to the time of their removal from a hot to a cooler mine. Copper miners, being exposed, in consequence of the great heat of the mines in which they work, to much greater vicissitudes of temperature than tin-miners, are especially liable to catarrhal attacks, sometimes inducing broncho-pneumonia, which materially accelerates the progress of their complaint, or even leads to the breaking down of the lung-tissue, and the development of phthisical symptoms.

Unless the progress of the disease be quickened by the supervention of some of the accidental circumstances just recited, miners often go on pursuing their occupation for many years without sensible illness: they, for the most part, become more or less asthmatical about the age of 40, and but comparatively few are met with between the ages of 40 and 50 years, whose health has not been unequivocally impaired by the circumstances attendant upon their occupation. The state of health of 127 miners, taken indiscriminately at several different mines, as they came from up work was inquired into; 30 of these had

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passed their fiftieth birth-day, not one-fourth of whom, according to their own statement, were free from shortness of breath, and the majority, though still able to work, were severely indisposed: many of the younger men were also "touched in the wind," as they expressed it, for not less than 66 out of the 127 suffered more or less from dyspnœa, cough, or expectoration, and only 61 declared themselves in sound health: most of the latter being young men under 30 years of age. Miners often go on working for many years after they have become decidedly asthmatical. Not less than seven sexagenarians, two of whom had reached the respective ages of 65 and 67 years, were seen at the Botallack Mine; and though the former of these two had discontinued working under ground, he was still able to work "at grass," as the upper world is called in mining phraseology, and to walk a distance of  $2\frac{1}{2}$  miles to and from his daily labour, notwithstanding the wheezing in his chest was loud enough to be heard in every part of the room, and his respiration so laborious that the shoulders were arched forwards, and the eyes protuberant. Mr. Bevan, a medical practitioner at St. Ives, said that he had known two or three miners able to work at 70 years of age, and that many of the men, though so impaired in health as to be unable to work, yet survived to a good old age; such instances are of course exceptional, comparatively few miners being able to continue their employment so late as their sixtieth year. Miners often survive for many years after they have become incapacitated for work, and even attain to a considerable age: sometimes they improve much in health after ceasing to work underground, and are thus enabled to pursue some lighter and more healthy employment.

The disease from which the Cornish miners suffer in consequence of their occupation is not of an entirely uniform character. Phthisis is apt to become developed at an early age in such as are predisposed for it; but, with the exception of these, and of persons in whom the supervention of pneumonia has induced breaking down of the lungs, "miners' consumption," as it is called, does not deserve the name. In most cases the disease of the Cornish miners is chronic bronchitis, sometimes accompanied by emphysemæ, and more frequently producing anasarca, than the similar affection among lead-miners. Very often, however, as has just been observed, pneumonia, generally traceable to cold, beginning with well-marked febrile symptoms, and accompanied by the characteristic expectoration, supervenes; hence, of course, a stethoscopical examination reveals a very different condition of the lungs in different cases. Sometimes, though there may be considerable dyspnœa, the evidence afforded by auscultation is almost negative; at others, more or less dullness on percussion is discovered in some part of the chest, and the respiration is altered in character, being found, according to circumstances, either tubular, sonorous or wheezing. Fine crepitation was found, in several instances, in the base of one or the other lung, and coarse crepitation was not uncommon in cases of long standing. Diseases of the heart, especially dilatation, were said, by some of the medical practitioners of Penzance and Redruth, to be common among the miners; other medical men, however, expressed a different opinion. The latter seems to be the more correct opinion; for among at least 20 invalid



or superannuated miners, who were examined by auscultation, disease of the heart was discovered in only two; one of whom had previously suffered from rheumatic fever, and the other was labouring under disease of the mitral valves. The heart was often feeble and its action slow; in two or three cases it was more or less displaced. So strong a prejudice exists against post-mortem examinations, that they have rarely been had recourse to. Indeed, medical practitioners who have had the widest experience in the diseases of miners, said they had never succeeded in gaining permission to make a single post-mortem examination. It was stated by some of the older practitioners, who have had the largest experience in the treatment of miners, that miners' consumption is now more tardily developed than formerly, a circumstance, no doubt, ascribable to the great improvements which are said to have been effected in the ventilation and management of the mines.

#### 4. REETH.—*Lead-mining.*

REETH is a lead-mining and agricultural district, comprising the valleys or dales of the Swale and Arkle, and the adjoining moors and fells from the borders of Westmoreland, to some distance below the junction of these rivers at the little town of Reeth. About half of the adult men were employed in lead-mining, and about one-fifth in the cultivation of the soil, at the time the census of 1851 was taken. A few women and children are also employed in washing the ore. The town of Reeth consists almost entirely of an open square, around which the houses are erected in an irregular fashion, and presents few of the characteristics of an ordinary town. Pulmonary affections produced a mortality at the average annual rate of 7·24 per 1,000 males, and of 5·28 per 1,000 females, during the septennial period 1848-54. The population increased only by 62 persons during the ten years previous to the last census, and has probably varied but little since that date. The death-rate from pulmonary affections during the last five years, calculated on the supposition that the population has remained nearly stationary, has been at the average annual rate of 6·59 per 1,000 males, and of 5·96 per 1,000 females. It would thus appear that whilst the male death-rate from these diseases has rather decreased, that of females has slightly increased, since the earlier period. The population of the district is, however, small, and accidental contingencies may have slightly influenced the mortality. Rather more than four-fifths of the deaths from pulmonary disease in both sexes were those of persons who had passed their fifteenth year, so that a larger proportion than common of the deaths were those of adults. Out of 91 deaths of men, aged 20 years and upwards, registered during the last five years, 62 are entered in the death register as those of lead-miners; but it would probably be a fallacy to assert that this number represents the actual mortality of the class, seeing that miners sometimes give up mining, and enter upon other occupations: hence their deaths would probably be recorded in the register under their new, rather than their original occupation. The excessive pressure of pulmonary diseases upon the adult population, especially upon the men of Reeth, is best shown by

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comparison with what may be termed a normally healthy district. Glendale, where the population was also nearly stationary during the ten years intervening between 1841 and 1851, and which, lead-mining excepted, agrees in many respects with Reeth, especially in the sparse distribution of its inhabitants over the surface of the soil, and in the absence of urban influences, affords a good standard for this comparison. Assuming that the population of both districts has remained nearly stationary since 1851, and that the character of the population, as regards age, has also varied little, the rate of death from pulmonary diseases in each district and in either sex, at several periods of life, is shown in the annexed Table:—

AVERAGE ANNUAL PROPORTION of DEATHS from PULMONARY DISEASE at several Periods of Life, in the Registration Districts of *Glendale* and *Reeth*, in each 1,000 Inhabitants of either Sex.

Period of Life.	Glendale, 1847-55.		Reeth, 1855-59.	
	Males.	Females.	Males.	Females.
All ages - - - - -	2·31	2·17	6·59	5·96
From 15 to 30 years of age -	1·81	2·44	2·09	3·98
„ 30 to 40 - ditto - -	3·06	2·55	5·60	4·95
„ 40 to 50 - ditto - -	3·49	2·35	14·28	7·17
Fifty years of age, and upwards -	4·15	3·52	22·27	18·91

Now, without considering the figures in the above Table as indicating more than a rough approximation to the truth, the differences of mortality in the two districts, and at the several periods of life, are too large to be attributed to any numerical error in estimating the number of the inhabitants, which, at the utmost, could not amount to more than 20 per cent. upon the population in any place, and could scarcely approach to nearly so high a figure in either of these very stationary districts. It is thus evident, that whilst the mortality produced by pulmonary affections during the first 15 years of adult life is rather higher in Reeth than in Glendale, the divergence increases as life advances, until the men of Reeth die four times as fast from these diseases as those of Glendale, between the ages of 40 and 50, and five times as fast over 50 years of age. The women of Reeth also die much faster than those of Glendale, though in not quite so large a proportion as the men.

Comparing the mortality of the men of Reeth above 40 years of age with that of the women of the same place and period of life, it appears that the men die twice as fast as the women between the ages of 40 and 50 years, after which, although the rate of mortality in both sexes is high, their relative mortality approximates nearer to the normal proportion. The high rate of death from pulmonary

affections in the adult female population of Reeth agrees with that of Alston, another lead-mining district, where, although the men die twice as fast as the women, the latter yet die at about twice the normal rate.

Marriages of consanguinity are common in Reeth and other lead-mining districts, the inhabitants of which usually dwell in small hamlets among the hills, remote in distance, and isolated in pursuits and habits from the rest of the world. One of the agents of the "Old Gang Mine" stated, that the men under his observation have deteriorated as compared with the preceding generation; that they are shorter in stature, thinner, smaller boned, and less robust, a change which he expressly referred to the marriages of the mining population being almost exclusively restricted to their own circle. Mr. M'Collah, the resident medical practitioner at Reeth, pronounced a similar opinion; and it was ascertained at Hurst, a small hamlet a few miles distant from Reeth, inhabited by lead-miners, that a large portion of the population are comprised under four or five family names, the inhabitants being, in fact, nearly all related to one another. The same circumstance occurs at Alston, in Cumberland, where the intermarriage of relatives is common, especially at Nent Head, a mining hamlet among the hills, distant several miles from Alston, and the seat of the London Lead Company's principal establishment in that neighbourhood. The people at Nent Head had intermarried so closely with one another, that the agents of the company observed a gradual deterioration in their size and strength. From circumstances connected with the operations of the company, a party of smelters were, some years ago, removed to Nent Head, since which time the physical character of the younger part of the population is said to have improved. The Rev. H. Kershaw, of Greenhow Hill, a lead-mining hamlet in the district of Pateley Bridge, likewise said that his parishioners intermarry very much among themselves, and form a very clannish community, the members of which are much attached to one another.

As might be expected, scrofulous affections are very common among the inhabitants of these places. Mr. M'Collah said that scrofulous abscesses and diseases of the joints prevail among the inhabitants of Swaledale, and the same observation may be applied to some of the other lead-mining districts. The deterioration of race arising from these causes most probably explains, in a great degree, the high rate of mortality from pulmonary diseases among the female population of Reeth and similar communities; but it is also possible that it may partly arise from the unhealthiness of the men, consequent upon their occupation, who often labour under chronic pulmonary disease from an early period of life, although they continue working as miners and procreating children during many subsequent years. If this view be correct, of course the health of the male population must also be more or less affected by the same causes; but the wide divergence of the male and female death-rates from pulmonary diseases evidently indicates the operation of some special conditions upon the health of the male population, from which the female is exempt.

Considering that only one-half the men of Reeth were lead-

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miners when the last census was taken; and that—exclusive of those who, having changed their occupation previous to death, are not entered on the death register as lead-miners—the deaths of 62 adult lead-miners have been recorded during the last five years, there can be no hesitation in attributing the large mortality from pulmonary diseases among the male inhabitants of Reeth mainly, if not exclusively, to the noxious character of their employment. It is at the same time evident that this influence chiefly manifests itself after the fortieth year of life. Notwithstanding the fallacious nature of any comparison founded exclusively upon the average age at death, seeing that this will vary much with the composition of the living population with respect of age, the inference that the unhealthy conditions contingent upon lead-mining operate chiefly soon after the fortieth year, derives support from the fact that the average age at death of the 62 men entered in the death register as lead-miners, was 49·12 years; whilst the average age at death of the remaining 27 men, who likewise died from pulmonary disease during the same period of five years was 60·88 years. It is, perhaps, worthy of note before passing from this subject, that the deaths of only four males and three females from pulmonary diseases are recorded on the death register of Reeth during the five years comprised in this inquiry as the deaths of sons or daughters of lead-miners, or as workers at the mines, between the ages of 5 and 15 years.

It appearing desirable to extend the investigation, in order to ascertain how far the deleterious influences from which lead-miners suffer are uniform in different districts, and, if so, whether they are unavoidable, Middleton, a lead-mining district in Teesdale, was visited for the purpose of examining one of the large mines belonging to the London Lead Company, and of obtaining the valuable evidence of the manager and resident medical officer. The information procured on the subject of lead-mining at Pateley Bridge, and also during a private inquiry made at Alston Moor, in the autumn of 1858, will likewise here be made use of.

The subject will be best considered under the following heads:—

1. The Nature of the Occupation.    2. The Habits of the Miners; and, 3. The Influence of the Occupation on Health.

1. *The Nature of the Occupation.*—Lead-mines were formerly worked by means of perpendicular shafts sunk from the surface of the ground, but are now almost, if not quite, always worked by means of levels driven into the earth in a horizontal direction from the side of a hill. These levels usually have a slight inclination upwards from the entrance, in order to promote the escape of water, and are of two sizes, the larger adapted for horse traffic, the smaller only for the passing to and fro of the miners. At Reeth these are respectively called “horse-drifts” and “durk-drifts.” The former are large enough to admit a horse drawing a waggon, with here and there a wider space, to allow the ingoing and outgoing trains to pass each other. In the Lead Company’s mines at Middleton only horse levels are used, and their average dimensions are 6½ feet in height by 4½ in breadth. In some other mines the horse-drifts are



smaller; those at the mines near Pateley Bridge are  $6\frac{1}{2}$  feet high by from 3 to  $3\frac{1}{2}$  broad; whilst others at Reeth scarcely exceed 6 feet in height by 3 in breadth. The "man-drifts," or "durk-drifts," at Pateley Bridge are 5 feet in height by  $2\frac{1}{2}$  in breadth; but those at Reeth are reported to be on the average not more than  $4\frac{1}{2}$  feet in height. In explanation of this, it was stated by the agent who showed the mine, that the miners like to make the smallest possible passage to get out the ore. On the other hand, Mr. Walton, the agent who showed the Wingell Mine, near Middleton, stated, that it is really as cheap to make a full-sized drift as a smaller one, and much more economical, as by this means the ore is got out more conveniently, and the men can work better in a capacious and well-ventilated, than in a narrow and imperfectly ventilated drift.

Levels are frequently driven at different elevations, and oftentimes parallel to one another. Whenever this happens, shafts are "sunk," or "risen," from the one drift to the other, both as a means of communication, and also to promote ventilation. The passage from level to level through these shafts is effected by means of perpendicular ladders, firmly secured to the rock by iron clamps. The main levels frequently diverge into two or more branches; and often, when levels upon the same plane are parallel to each other, cross-drifts are cut from one to the other, both to facilitate communication between the different parts of the mine, and likewise to assist its ventilation. The levels are often driven to a very great distance under ground. The point at which ore was being excavated in the Wingell Mine at the time of inspection, was more than half a mile from the entrance. In most mines ventilating shafts are raised from the upper levels to the surface of the earth. In the best managed mines, whenever it is possible, these shafts are placed at stated distances; but in the smaller mines they are comparatively rare. The strata through which the levels pass vary in character, but mostly consist either of limestone, sandstone, or shale (in mining phraseology called "plate"); and the condition of the mines, as regards ventilation and purity of air, depends much upon the nature of the stratification. The mines driven through limestone are, generally speaking, the most wholesome; and their ventilation is frequently much favoured by what are termed "shakes," or cavities in the strata, which are sometimes of considerable size, but at others consist of mere crevices or chinks. These shakes sometimes extend to the surface; and though probably communicating by a very small fissure with the open air, effect a communication between the external atmosphere and that of the mine. Mines driven in limestone are also said to be less dusty than such as are driven in either sandstone or shale.

Mines driven through shale are the most unwholesome, and the least pure as regards their atmosphere. They are much dustier than the others, especially when the shale is very dry, and are more liable to have their atmosphere vitiated by escapes of gas. Though gas is said to be most frequently evolved from shale, it is also sometimes met with in mines driven through other strata, particularly sandstone. It was difficult to ascertain from such evidence as was alone procurable, the exact nature of the gas; but certainly carbonic acid gas, or "choke-damp," is the most common. An inflammable

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gas, analogous to the fire-damp of coal-mines, is sometimes, though rarely, met with in lead-mines. Escapes of gas are often very partial, so that it will sometimes happen that the atmosphere of one part of a level is so impure, that candles will scarcely burn in it, while that of other portions remains perfectly unaffected. The escape of gas varies greatly in amount at different times, being much influenced by the state of the external atmosphere. It is apt to be greatest about the time when a change of weather, particularly, it is said, from fair to foul, is about to occur, which it sometimes indicates for several previous days. Hence it happens that mines which are generally quite free from foul air, are unable to be worked without hazard to the miner at periods of atmospheric vicissitude.

When ore is found, it is followed by the miners usually in an upward, sometimes in a downward direction. Even in the best managed mines the air is apt to be impure in the blind extremities of drifts, called by the miners "foreheads"; and in the driving of cross-cuts, by which communication is effected between parallel drifts on the same plane, or of "rises" driven for the purpose of communicating with the external atmosphere, or a higher level. For the same reason, making a new mine is more dangerous to the miners than working an old one, as the latter is sure to be better ventilated than the former. Such places are only ventilated from behind; and as the air does not penetrate freely into these *culs-de-sac*, artificial means are necessary for driving it inwards. Sometimes a tube carried from the pure air to the "forehead," "cross-cut," "rising," or "sump," where the men are working, proves sufficient to produce an inward and outward current; pure air finding its way up the tube, whilst the impure passes back through the drift. When this is insufficient, air is driven in by means of a fan-blast, or a water-blast, the latter being a very simple, and often effectual, mode of conveying air into the recesses of the mine. It was stated on all hands, by miners as well as by agents and managers, that great improvements in the ventilation of mines have been effected within the last thirty or forty years.

Lead mines are now chiefly worked by blasting; but the shale or plate is still often worked with the pick, a very dusty process, if the shale be dry. Dust is also produced in boring the holes for receiving the charges of gunpowder; when these holes are bored in a downward direction, careful men pour water into them from time to time as they proceed, in order to prevent the dust from rising. For the same reason, some of the men work with uncovered arms, asserting that shirt sleeves collect the dust, which is dispersed into the air around the man at each movement of his arms, especially when using the pick. When a charge is fired, the men retreat to some distance to avoid the explosion, but a suffocating sulphureous smoke hangs about the level for some time afterwards, the slowness or rapidity of its escape varying with the state of the atmosphere, and the more or less perfect ventilation of the mine. It was stated by some of the miners that the mine at Hurst is sometimes not free from smoke until six hours after an explosion. It is usual, in the mines belonging to the London Lead Company, to fire as many blasts as possible, just before the men leave for dinner, so as to allow of the dispersion



of the smoke before they return to work. But notwithstanding every precaution, the inhaling of air impregnated with smoke, and vitiated by the products of combustion, is the chief evil to which lead-miners are exposed. When ore has been excavated by blasting, it is broken into small pieces by hand before removal from the mine, and again the larger pieces are broken at the surface before being put into the mill. The men engaged in this process are exposed to conditions somewhat similar, though probably less injurious than those which are known to be so hurtful to masons and stone-hewers.

2. *The Habits of the Miners.*—The lead miners for the most part reside in small hamlets or detached cottages scattered among the hills, very frequently at some distance from the mines. Their dwellings are, in general, very superior to those of agricultural labourers in the midland and southern counties of England, are usually of good size, and almost always remarkably clean, and comfortably furnished. Many lead miners, especially such as reside in isolated cottages, have a small portion of land near their dwellings, the management of which profitably employs their leisure hours. Miners who live within two or three miles of the mine in which they work, commonly walk daily to and from their place of occupation. Dwellings termed mine-shops are provided by the proprietors of the larger mines, for the accommodation of such of the men as reside beyond a walking distance from the place of their labour. The London Lead Company have provided shops of this kind both at the Wingell Mine in Teesdale, and at Nent Head, where every convenience is provided for the men, including accommodation for keeping their food and clothes, and for cooking.

Lead mines are worked by the men to a certain extent as a speculation. The work to be done having been fixed by the agents, is let to the men in "bargains," as they are termed, each bargain being taken by a partnership composed of several men. These bargains in small mines are often let by the month, but only thrice a year in the mines belonging to the London Lead Company. The men composing a partnership work in "shifts," one set coming on as the others leave work. The mines at Reeth and Pateley Bridge are worked by shifts of six hours each, making 36 hours, the average duration of a miner's labour per week; those of the London Lead Company of eight hours each; but as the men only work five days in the week, their total period of labour per week does not exceed 40 hours. The men who live at the mine-shops during the week work extra hours each day, so as to work their full complement of hours in four days, and are thus absent from home only three nights in each week. In many of the mines boys commence working at an early age, sometimes at the age of seven, more commonly at that of eight years; their employment consists at first in loading the waggons, and assisting the men. In the London Lead Company's works no boy under 12 years of age is employed, and then only in washing the ore on the surface. When boys have reached the age of 14, they are permitted to work under ground during the three winter months, when, on account of the frost, it is impossible to wash the ore; but it is not until they have completed their 18th year that they are

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allowed to work entirely in the bowels of the earth. The only exceptions to these regulations are made in favour of boys employed in turning the fans for ventilation; but only a few boys are employed in this manner, and they are always set to work in the best air in the mine.

3. *Influence of the Occupation upon Health.*—The habitual, or at least frequent, inhalation by the miners of an atmosphere rendered more or less impure by the admixture of smoke and other products of combustion, of dust, or of the gases exhaled from the strata, usually produces slight bronchial irritation at an early stage of life. The only evidence of this, perhaps for many years, is a slight habitual expectoration, tinged, after working in the mine, with the soot or dust inhaled whilst at work. Hence men, whose expectoration at the beginning of the week consists only of clear bluish mucus, will, at the close of their weekly labour, raise blackish or blue expectoration, according to the nature of the foreign matter that has been inhaled. As life advances, dyspnœa is added to the other symptoms, and at length most of the miners become asthmatical, are unable to move without more or less difficulty of breathing, and suffer habitually from cough and expectoration. The age when “miner’s asthma,” as it is termed, becomes developed, varies much according to the character of the mine, and the place of work. Men employed in ill-ventilated mines, or in driving a level forwards, or in cross cutting, or in driving “rises,” or “sumps,” in all of which situations the smoke and dust are apt to hang in the air, as a rule suffer earlier than such as work in better ventilated places. Hence the period of disablement arrives, on the average, at an earlier or later period of life to the men employed in different mines according as the latter are better or worse ventilated, and more or less liable to gaseous exhalations, dust, or smoke. The age at which miners for the most part become decidedly asthmatical is about the 45th year, some, of course, succumbing earlier, others resisting the deleterious concomitants of their labour for a greater length of time. In one mine which was visited, all the men, it was stated, become short breasted before the age of 40, whilst at Greenhow Hill few of the minors, it was said, suffer materially until they have past the age of 50 years. One proof of the comparative healthfulness of the lead miners of Greenhow Hill is afforded by the rarity of widows among the population, whilst, on the other hand, the lead mining district of Alston had more widows, in proportion to its population, in 1851, than any other place in the kingdom. The inhabitants of Greenhow Hill, of all ages and classes, fall short of 800 in number, 70 or 80 of whom are employed in the mines. Several of these are upwards of 60 years of age; two upwards of 70 years old were still at work; and one aged 80, who worked until recently as a miner, is now employed as a carter or labourer on the surface. One man still at work, aged 67 years, who has worked for 57 years in the mines, regarded himself as in sound health, but was evidently asthmatical. Another of the same age had discontinued working under ground for 10 years, not by reason of failure of health, but because he had realized property which he could employ to greater advantage in a different calling. The last-named person said that two old miners of the respective ages of 82 and 86 years,



who had relinquished mining for some years, are still resident in the neighbourhood.

On the other hand, the oldest men seen at work and in good health at Reeth were of the respective ages of 48 and 52, though it was stated by one of the agents that out of 350 men employed in the Old Gang Mine, one or two are sexagenarians. The whole of the men at Hurst, it is said, become asthmatical comparatively early in life, few, if any, remaining tolerably free from it beyond their 40th year. Out of 60 or 70 men employed in the mine, the oldest was said to be little more than 50 years of age, and he was regarded as an old miner. Three superannuated miners seen at Hurst were aged respectively 41, 32, and 28 years. The family history of one of these men well illustrates the pernicious influence on health of working in ill-ventilated unwholesome lead mines. The man himself, aged 41, had been incapacitated for work by miner's asthma during ten years. Of five brothers, one died at the age of 45 years from miner's asthma; a second, aged 46, is asthmatical, but not entirely unfit for work; the third, aged 50, who also suffers from the same disease, is unable to work; whilst the two other brothers, both of whom are engaged in agricultural labour, and have past their 43d year, enjoy good health. Mr. Walton, one of the agents of the Middleton Mine, said that a few men were employed in the mine whose age bordered on 60 years, and a person who is still employed about the mine in some superior capacity, but who had ceased to work as an actual miner for the preceding 10 years, stated himself to be 67 years of age, and the oldest miner employed in the district. Men who have previously shown themselves but slightly affected, being thereby less able to resist the deleterious influences attendant on mining than men in health, often break down rapidly on being removed to a "windless," that is an ill-ventilated place of work. On the other hand, timely removal to a better situation often proves an effectual means of checking the progress of the complaint. Several lead miners who, feeling their health injured by their occupation, had either worked for a time at coal mining, or at some employment on the surface of the earth, asserted that they had by this means very much mitigated their ailments, some of them having subsequently been able to resume their original occupation. Irrespective of other causes of foul air, the employment of too many men in a drift sometimes vitiates the atmosphere, and renders it hurtful to the miners. This probably never happens in well-regulated mines, but is said sometimes to occur in those of an inferior description.

A general impression prevails both among the miners themselves and also among medical practitioners in the lead-mining districts, that boys who commence working underground at a tender age are more susceptible to the injurious conditions of a miner's life than those who begin at a riper age. The evidence obtained on this subject is insufficient to determine the correctness of the opinion, which is, however, so generally entertained, that it at least deserves to be mentioned.

Mines driven in plate or shale are said to be more injurious to health than those in sandstone, and the latter to be worse than those in limestone strata; but evidently much in every case depends upon

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the mode of work, the size of the levels, and the excellency or imperfectness of the arrangements for ventilation. It is thought that men who, residing at a moderate distance from the mines, walk to and from their labour daily, suffer less than those who occupy the mine-shops, or live close to the mines; also that those who employ their spare hours in agricultural pursuits resist the deleterious influences of their mining occupation longer than others. In explanation of this opinion, which is generally entertained throughout the lead-mining districts that were visited, it is asserted, that miners while in active exercise in the open air raise a good deal of the dust and soot which they have inhaled during their hours of labour; and it is certain that, among the mines visited, the one at which the men break down soonest was that close to which the miners dwell. Mr. Coates, agent of the Old Gang Mine, stated that he himself had worked 21 years as a miner without injury, and accounted for his exemption on the ground that he had always worked a good deal at out-door labour. Mr. M'Collah of Reeth, and Mr. Ewart of Middleton, medical practitioners of much experience in the diseases of lead-miners, believe in the advantage of the miners walking some distance after quitting their work.

The constant bronchial irritation produced by their occupation renders the miners very prone to catarrhal attacks, to the exciting causes of which they are usually much exposed, from the elevated situations and cold bleak climate in which they usually reside. As might be expected, catarrhal attacks sometimes determine the accession of more urgent dyspnœa, and accelerate the progress of the disease, an already weakened bronchial membrane naturally recovering more slowly and less perfectly than a healthy one from an attack of acute bronchitis. Indeed, so accustomed are the miners to suffer from slight dyspnœa and expectoration, that they frequently date the commencement of their illness from a severe catarrhal attack, although, on careful inquiry, it is usually found that they had previously been slightly "touched in the wind," and had an expectoration, though, as they generally asserted, unaccompanied by cough, and not greater than that to which all miners are accustomed; the habit of expectorating a blueish mucus, more or less tinged with soot or dust, being an acknowledged concomitant of a lead-miner's existence. Apart from catarrhal complications the lead-miner's disease proceeds slowly and steadily. At first there is a sense of oppression at the chest, attended by slight dyspnœa on exposure to dust or foul air: by-and-by slight habitual expectoration becomes established, together with dyspnœa on exertion, which presently is accompanied by cough, and a more copious expectoration. Phthisis is developed in such as are predisposed to that disease. In others the disease is essentially bronchitic, and the sufferers become liable to the several consequences of chronic bronchitis, such as dilatation of the heart, congestion, and enlargement of the liver, ascites and anasarca; emphysemæ appears less frequent in the chronic bronchitis of lead-miners than among persons suffering from this disease in the metropolis. The course of the disease appears to vary in different situations, and hæmoptysis especially, elsewhere rare, is not uncommon at Nent Head. This fact, mentioned by Mr. Carson, the resident medical officer of the



Lead Company at that place, was confirmed by Mr. Ewart of Middleton, who, having been promoted from Nent Head some fourteen years since, had thus had the opportunity of observing the miner's disease in both places. Unless cut off by an acute attack of bronchitis or pneumonia, or unless the progress of the case to a fatal termination be accelerated by a repetition of catarrhal attacks, the miners usually survive for several, often for many years after they have become incapacitated from following their employment. Indeed, provided they discontinue working in the mines at a sufficiently early age, they often improve in health afterwards, and, living as they do in a pure, healthy atmosphere, survive to a good old age.

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5. PATELEY BRIDGE.—*Flax Manufacture.*

THE registration district of Pateley Bridge comprises the upper portion of Nidderdale, and the surrounding hills and moors. Nearly half the men were engaged in the cultivation of the soil when the census of 1851 was taken; about one-tenth were lead-miners, and more than one-seventh were employed in the manufacture of flax. One-twelfth of the women over 20 years of age, and an uncertain proportion of boys and girls under that age, were also employed in the flax factories at the same date. The little town of Pateley Bridge is so inconsiderable, that it has not been ranked among towns by the Census Commissioners. The district is in all other respects exclusively rural; the mines are remotely situated among the hills, and the flax factories, for the most part, near the margin of the River Nidd. Pulmonary affections produced an average annual mortality at the rate of 5.08 per 1,000 males, and of 3.91 per 1,000 females, during the septennial period 1848-54. The population of the district slightly decreased during the ten years antecedent to the last census—a circumstance attributed in the Report of the Commissioners to migration to other districts, consequent upon the failure of lead mines, and the stoppage of factories. It being quite impossible to estimate accurately the present population, it must be assumed to have remained stationary since 1851. On this supposition the mortality from pulmonary affections during the five years 1855-59 has been at the average annual rate of 6.54 per 1,000 males, and of 8.15 per 1,000 females.

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Whatever doubt the uncertain number of the population may cast upon these figures, they may at least be presumed to represent with tolerable correctness the relative mortality of the sexes. Hence it would appear that the mortality among females, which was less than that among males in the earlier period, has been considerably greater in the later period. It is true the numbers dealt with are but small, for only 126 deaths of males and 152 of females from pulmonary affections occurred during the last five years; but, as the proportions are tolerably well preserved from year to year, there seems no reason to suppose the calculations subject to any serious fallacy on this account. It is also worthy of note that, whilst the total mortality of males was greater than that of females during



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the first five years of the last decennium, the mortality of females has very considerably exceeded that of males during the five years comprised in the present inquiry. Assuming, as before, that the population has remained stationary, the average annual mortality from all causes during the five years 1850-54 was at the rate of 22·76 per 1,000 males, and of 20·05 per 1,000 females, during the four years 1855-58, at the rate of 22·02 per 1,000 males and of 27·48 per 1,000 females.\* Thus the mortality of males from all causes has remained nearly stationary, whilst that of females has considerably increased. What may be regarded as the identity of the male death-rate, for small fractions are quite unimportant where only such small numbers are dealt with, confirms the supposition that the population has remained almost stationary since 1851. It seems also unlikely that any sufficient increase of the female part of the population should have occurred to account for the great increase in the mortality of females.

Four-fifths of the deaths of males, and six-sevenths of those of females, from pulmonary affections, were those of persons who had passed the age of 15 years. The mortality from these diseases at Pateley Bridge has, therefore, pressed especially upon the adult population. Two-fifths of the deaths of males, and nearly one-third those of females, were the deaths of persons above 50 years of age; the mortality has, therefore, fallen largely on persons who had passed the meridian of life. But the excess of mortality has not been limited to this period of life, especially in females who have died in double proportion to those of Glendale, between the ages of 15 and 30, and in more than double proportion between the ages of 30 and 50. The rate of mortality among males between the ages of 15 and 30 was also more than double that which prevailed in Glendale. In the next ten years of life the rate was less than twice as high among men, and it was almost identical with that of Glendale between the ages of 40 and 50. The rate of mortality from pulmonary diseases in both sexes in Pateley Bridge after the 50th year, was greatly in excess of the normal rate, that of males being nearly four times, and that of females nearly five times as high as the rate which prevailed in Glendale.

Mr. Warburton, a resident medical practitioner at Pateley Bridge, having observed the great prevalence of pulmonary diseases among the population, says that they do not press especially upon any particular class, but are equally prevalent among the agricultural as among the mining and manufacturing sections of the community. He attributes their prevalence chiefly to marriages of consanguinity, which are said to be common, and partly to the poor diet of the labouring classes, which consists chiefly of bread and tea. The death register throws very little light upon the causes of the high rate of mortality from pulmonary diseases in Pateley Bridge. Only 15 deaths are recorded during the last five years as those of lead-miners, or of the sons of lead miners, who, from their age at death, may be presumed to have worked in the mines. Small as this number appears, it yet forms a larger pro-

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\* The data for these calculations are taken from the published Reports of the Registrar-General. The Report for 1859 not being yet issued, only four years could be included in the second period.



portion of the mortality than would have fallen upon this class if the deaths had been equally distributed among the population. The deaths of only eight men employed in the flax manufacture appear in the death register, a number very considerably less than the proper proportion if the mortality of this class bore an exact proportion to the number of men employed in that occupation. It is, therefore, certain that the death registers are not entirely trustworthy regarding the occupation of the persons whose deaths they record, a circumstance probably to be explained by the fact that the working classes sometimes change their occupation; hence, men who in early life were miners or flax-workers having adopted some other occupation at a later period, are entered in the death register under the designation of their recent rather than of their original calling. Such changes of employment are, perhaps, especially apt to occur in rural districts, where the common occupation of the inhabitants requires but little skill. In like manner, though their health may have been impaired by their previous labour, women on their marriage frequently discontinuing factory work, cease to be regarded as factory operatives. Moreover the occupations followed by females are rarely recorded in the death register, it being usual to style them "daughters" or "wives" under the father's or husband's designation; as, for instance, daughter of a lead miner, or wife of a flax-dresser, as the case may be. For these reasons it is quite impossible to deduce any satisfactory conclusions from the death register of the influence which particular employments may have exercised on the mortality of females.

It may, however, be assumed with certainty, that the occupations of lead-mining and of the manufacturing of flax have exercised an injurious influence upon the health of the population of Pateley Bridge, and contributed to produce the high rate of mortality from pulmonary diseases which has prevailed in both the earlier and later periods to which reference has been made. The deleterious influences which press upon lead miners, and render them peculiarly liable to pulmonary diseases, have already been so fully considered under the head of Reeth, that it is unnecessary to recapitulate them at length. As is there explained, the evils incidental to lead-mining vary greatly, according to the nature of the stratification in which the mines are excavated, and the precautions adopted to secure free and efficient ventilation. Some of the lead mines of Pateley Bridge, especially that at Greenhow Hill, have also been referred to as being remarkably healthy. Yet it must be observed, that though several of the mines of Pateley Bridge are said to be less deleterious than lead mines in general, there are others of an unwholesome kind. Mr. Metcalfe, one of the principal flax manufacturers of Pateley Bridge, who is also engaged in lead-mining, asserted, that the miners suffer much from their occupation; that they become sallow, acquire an unhealthy aspect, and are apt to become consumptive about the middle of life. Mr. John Ashworth, a shareholder in a lead mine, said it was very unhealthy, from the prevalence of choke-damp in particular states of the atmosphere. Another gentleman, who is a mining agent, gave similar evidence, and attributed the injury to health mainly to defective ventilation, stating that even when artificial means are employed for conveying pure air into the

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mines, these means are often insufficient for the purpose, especially when choke-damp is disengaged from the strata.

Thus, notwithstanding the scanty evidence to this effect, gleaned from the entries in the death register, there can be no doubt that one cause of the high rate of mortality from pulmonary diseases in Pateley Bridge is the occupation of lead-mining, followed by a certain proportion of the men. There can also be little doubt, from the evidence about to be adduced, that the manufacturing of flax, especially in some of its processes, is a fruitful cause of pulmonary disease. It may be well to premise that the flax operatives of Pateley Bridge, like the lead-miners of the same place, are tolerably well housed; that their dwellings are generally comfortable, and that their personal and domestic habits are, for the most part, cleanly. The hours of labour are not excessive, the factories being under the restrictions laid down by the Factory Act. Many young persons of both sexes under the age of 20, and a considerable number of short-timers, both boys and girls, are employed in the flax mills; but it is quite impossible to estimate the proportion which they hold to the number of the population of their respective ages. Many of these subsequently relinquish the occupation, but perhaps not always before their health has been undermined. Indeed, it was clearly ascertained that boys sometimes quit the factories in consequence of their health giving way; and it was distinctly stated by an overlooker in one of the factories, that when they fell ill, he discharged them, deeming it undesirable that they should continue the occupation at the expense of their health. In other instances it is customary, when the operatives suffer from the nature of their employment, to remove them to a healthier department of the same manufactory, as, for example, into the reeling or the spinning-room. In some cases this change is attended with the happiest result, operatives who had previously been suffering from the unhealthy conditions contingent upon their occupation being much benefited, and occasionally perfectly relieved, by the change of employment. In order to render the report on the influence of the flax manufacture upon health as complete as possible, the information obtained on the subject in Leeds and Preston, will likewise here be made use of.

Of the several processes carried on in flax-mills, hackling, carding and line preparing, are more or less dusty, so that the atmosphere of the rooms in which they are going on is loaded with dust in proportion to the quality of the flax that is being manufactured, and the means employed to prevent the dispersion of the dust into the air, and its inhalation by the operatives. Several varieties of flax, named from the places whence they come, are manufactured in this country: the most common are the Dutch, Baltic, Irish, French, and Flemish, which yield dust in the process of manufacture, in the order in which they have been named, the Dutch being the most, the Flemish the least, dusty. Flax is also imported from America and India; both of which varieties are said to be very dusty. There are moreover several varieties of each kind of flax, which differ materially from one another; and it is said that, independently of other circumstances, the mode of preparing the flax causes a difference in the dustiness of the article when it comes to be manufac-



tured; that which has been prepared by exposure to rain upon the grass being less dusty than such as has been steeped in water. The manufacture of the refuse from the hackle, called tow, which is spun into coarser material, is likewise attended by much dust. The danger to health will vary in different manufactories, according as the least or the most dusty kind of flax is manufactured. Several operatives asserted, that they had not suffered sensibly in health from their occupation until they worked in Dutch flax, when the inhaling of the dust soon caused bronchial irritation. Of the several above-named processes, hand hackling is the most pernicious; this process has now been partially superseded by machine hackling, which, though still often injurious to the health of the operatives, is decidedly less so than the former. There is likewise a considerable quantity of dust given off in the processes of carding and line preparing, from which the operatives suffer in proportion to its amount.

These several processes are also more or less unhealthy in proportion to the absence of proper care on the part of the manufacturer for preventing the dispersion of the dust into the atmosphere of the working rooms. In some factories the danger to health is reduced to a minimum by the pains bestowed upon ventilation, or by the use of flues or other contrivances, for withdrawing the dust as it is formed from the atmosphere of the apartment; this is sometimes accomplished by covering the machines, so as to prevent the dispersion of the dust; at others by currents of air drawing the dust, as it is formed into a tube connected with a ventilating flue. In other factories either no means at all, or very inadequate means, are employed for preventing the dispersion of dust into the atmosphere, and, of course, the operatives suffer in consequence of this inattention of the master. Sometimes the only mode of ventilation is by windows, one sash or a few panes of which being suspended by the middle upon pivots, admit the air freely when open; but in this mode of ventilation the air often enters so nearly on a level with the faces of the operatives, that they can only bear the draught in warm weather. Besides the injury to health arising from inhaling air charged with dust, the flax operatives employed in the spinning rooms become very susceptible of cold from working in an elevated temperature. The "roving," as it is technically called, is passed in the process of spinning through troughs of water, heated to a temperature ranging from 140° to 190°; and although these troughs are generally covered, small notches only being left to admit the passing of the threads, yet the atmosphere of the spinning-rooms is much elevated by the heat and steam arising from the hot water. Thus flax operatives are exposed to two very different influences, both more or less likely to injure health, one, the inhaling of dust directly, by the bronchial irritation which it excites; the other, the working in a hot, moist and relaxing atmosphere indirectly, by rendering them particularly liable to take cold.

Flax factories are also sometimes unhealthy, from a cause common to them, and likewise to many other work places where numerous operatives are gathered together; this is, the working in ill-ventilated apartments, artificially heated by means of pipes conveying steam or hot water. The importance of a constant circulation of air, irrespective

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of the cubical size of work-places, is in general not sufficiently considered by the builders of factories, neither is the circumstance that air should hold a certain quantity of watery vapour in solution in proportion to the elevation of its temperature. A great many factories are ignorantly built in defiance of these laws, so essential to the health of the operatives, who unquestionably suffer in consequence of the neglect of them, though it may perhaps be all but impossible to estimate exactly the amount of injury they sustain. There can be no doubt that this, as well as other remediable evils connected with manufactories, is committed involuntarily and through ignorance, and that the proper course towards removing them would be to point them out to the masters, who, for the most part, evince the greatest desire to adopt any improvements likely to promote the health of their work-people. This is clearly shown in certain cases, where better information has led to the adoption of more or less perfect means of preventing injury to health. While the aspect of some of the flax operatives, in Preston for example, formed an unfavourable contrast to that of the operatives in the cotton factories, the appearance of the weavers, and some of the other flax operatives, in a large flax mill at Leeds, presented a not unfavourable contrast to that of the operatives in the woollen factories of the same town: this, doubtless, arose from their being employed in a part of the factory where especial pains have been bestowed upon the warming and ventilation, and upon the preservation of the due relation between the temperature and moisture of the atmosphere.

The effects of exposure to the dust of flax are manifested upon the mucous membranes. The stomach is very apt to become deranged by the dust swallowed, and hence the flax operatives, more particularly the hacklers, often suffer from dyspepsia, and are sallow and look sickly; the eyes often become sore, the margins of the eyelids being swollen and inflamed, and the sight is said occasionally to become impaired. But the most serious effect is produced on the mucous membrane of the air passages; oppression of the chest, followed by dyspnœa, cough, and eventually by expectoration, are ordinary results of inhaling air charged with the dust of flax. Epistaxis is an occasional, and hæmoptysis a very frequent consequence of the same cause. It is remarkable that dyspnœa, sometimes of an asthmatic character, often long precedes the accession of cough and expectoration, or perhaps, more properly speaking, the cough and expectoration are in the beginning too slight to attract the notice of the sufferer, whilst the dyspnœa reminds him of its presence whenever he attempts brisk locomotion. As has already been said, many of the flax operatives forsake the occupation at an early age, on account of the injurious influence it exercises over the health; but though this is true, the injury to health is commonly very gradual, and constant discomfort and serious disease only become established towards middle life, men employed in any dusty department of the manufacture rarely attaining the age of 45 or 50 years without suffering more or less severely from bronchial disease.

So completely aware are the masters of the injurious nature of this occupation, that some of them have endeavoured to introduce the use of respirators, to prevent the admission of dust into the air.



passages in respiration. One manufacturer purchased fifty respirators, to be distributed among his operatives; but the men soon ceased to use them. Perhaps the best proof of the benefit derivable from the use of respirators by persons compelled to breathe an atmosphere charged with dust, is afforded by the circumstance that some of the flax operatives habitually tie a handkerchief, or a piece of crape, or some similar material, over the mouth, in order to exclude the dust. It often happens that of several operatives working in the same department, and equally exposed to inhale dust, some will adopt a protection of the kind just mentioned, whilst others disregard it. Evidence regarding the condition of their health, and the influence of their occupation upon it, was collected from more than 100 male and female operatives, of various ages, employed in the dusty processes of the manufacture of flax. The testimony was taken indiscriminately, without reference to the aspect of the person examined, and as impartially as possible. Out of 107 persons, notes of whose evidence were taken at the time of inquiry, 79 were suffering at the time, or had formerly suffered, from some degree of bronchial irritation, which they ascribed to the unhealthy nature of their employment. Of these, at least 19 had been affected with hæmoptysis, some of them only once, but the greater number more frequently, and some of them repeatedly. In a factory where 27 flax hacklers were employed, 23 of them were habitually asthmatical, or at least suffered to some extent from their employment, and five had been afflicted with hæmoptysis. The youngest of these hand-hacklers was 18, the oldest 72 years of age; eighteen of them were over 50, and only five were under 30 years of age; one of them, aged 62, asserted that he had not suffered from his employment; but there was good reason for doubting the correctness of his statement. Many of the hacklers, and some of the other operatives employed in the dusty departments of flax-mills, have raucous voices. Many of the older men are seen at a glance to be short breasted; their rounded shoulders, emaciated frames, prominent eyes, and laborious wheezing respiration, all clearly show that they suffer habitually from dyspnœa; indeed it is marvellous to see men in the condition of some of the hand-hacklers still able to continue at their labour, a circumstance probably ascribable to the very slow and gradual progress of the disease, and the consequent adaptation of the system to the habitual ailment.

Notwithstanding that men at ages so advanced as 60 years and upwards are sometimes found working as hand-hacklers, the attainment of this age must, from the all but universal statements of both employers and operatives, be deemed exceptional. It was stated by manufacturers, foremen, over-lookers, and the operatives themselves, that working in the more dusty departments of the manufactory rarely fails to make itself felt towards middle life, few persons being able to work in an atmosphere loaded with the dusty particles for 20 years continuously without sustaining serious injury to health. The health of the women employed in the line-preparing room of another factory was inquired into in the manner adopted with regard to the hacklers, already mentioned. It is always difficult to obtain direct evidence from female operatives; but the inquiry showed that all those who had worked for a considerable length of time in this branch of manufac-

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ture, were asthmatical, and that several of them had suffered from hæmoptysis. The operatives employed in the carding-rooms, unless the machines be properly protected to prevent the dispersion of the dust, frequently labour under habitual dyspnœa, cough, and expectoration: and it is especially in the carding-rooms that the operatives are accustomed to tie up their mouths, to prevent them inhaling the dust. The effect on a healthy stranger of entering these rooms is most unpleasant: the dust floating in the atmosphere, irritates the nasal and bronchial passages, producing sneezing, and a sense of oppression in the chest, which do not cease till some time after the visitor has left the apartment. The manager of a large factory asserted, that remaining for any continuance in one of the carding-rooms invariably produced in him, for a time, all the symptoms and sensations of a catarrh.

Although the effects of temporarily inhaling the atmosphere of the dusty departments of a flax-mill upon persons not accustomed to the employment are so obvious, the operatives, after a time, become inured to it, and are able to tolerate it for some time without sensible injury. It was stated that the operatives are more affected by the dust at the beginning than at the close of the week, and that they always suffer more on resuming the employment after an interval of cessation. A catarrhal attack invariably aggravates the ailments of the flax operatives, and frequently proves the immediate cause of severe illness; in other words, persons who habitually suffer from slight bronchial disease in consequence of inhaling mechanical irritants, are more apt to have catarrh pass into chronic bronchitis than those who are exempt from such conditions. As life advances, the power of resisting the pernicious influence of their occupation diminishes, and more or less of permanent dyspnœa, and other results of bronchial irritation, supervene. Dyspnœa usually precedes both cough and expectoration; but the flax-workers, like the lead-miners, have a slight habitual spit, in which the particles inhaled during their labour are imbedded. It was stated in several of the rural factories that operatives who, like some of those at Pateley Bridge, live a mile or more from the factories, enjoy better health, and only suffer at a later age from dyspnœa than those who live hard by the factories. The condition of the weather exercises a sensible influence in mitigating or aggravating the evils arising from this employment; dull, heavy weather aggravates, bright clear weather usually mitigates, the bronchial irritation.

But little opportunity was afforded for a medical examination of sick operatives. Of such as were examined, the respiration of those who had dyspnœa without much cough or expectoration was found to be of a dry, sonorous character. At a later period the ordinary signs of chronic bronchitis, and sometimes of emphysema, may be discovered by means of auscultation.

#### 6. MACCLESFIELD and LEEK.—*Silk Manufacture.*

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SILK is the staple article of manufacture in both Macclesfield and Leek. The town of Macclesfield contained 39,048, and that of Leek 8,877 inhabitants in the year 1851. Each registration district



comprises also several villages and hamlets, and a considerable rural population. When the census of 1851 was taken, 31 per cent. of the men, and 26 per cent. of the women, of Macclesfield, above 20 years of age were employed in the silk manufacture. About 19 per cent. of the men were engaged in the cultivation of the soil, and a small proportion in the cotton manufacture and in mining. About 15 per cent. of the men and 17 per cent. of the women of Leek above the age of 20 years were at the same date employed in the manufacture of silk; 37 per cent., or more than one-third, of the men were occupied in the cultivation of the soil, and 7 per cent. in mining. A large, but uncertain proportion of young women, and of boys and girls, are also employed in the silk manufacture in both places.

The town is in both districts the centre of the silk manufacture; but whilst in Leek this manufacture is confined to the town and its immediate precincts, it extends, more or less, throughout the registration district of Macclesfield. Neither Leek nor Macclesfield is densely built. The former contains some narrow streets and courts, but the principal streets are wide and airy. The latter has, for a town of its size, an unusual number of open spaces. These districts differ in this respect, that whilst the manufactures of Macclesfield, with the exception of weaving, are chiefly carried on in factories, a large portion of the work in Leek is done at home, or in workshops and sheds, which can scarcely be called factories.

The mortality produced by pulmonary diseases in the registration district of Macclesfield during the septennial period 1848-54, was at the annual average rate of 6·91 per 1,000 males, and of 8·04 per 1,000 females. That of Leek during the same period was at the annual average rate of 5·88 per 1,000 males, and of 7·05 per 1,000 females. If the population of each of these districts have respectively increased in the same ratio since the year 1851 as it increased during the 10 preceding years, the mortality during the five years 1855-59 has been at the average annual rate of 6·03 per 1,000 males, and of 7·21 per 1,000 females, in Macclesfield; and of 5·53 per 1,000 males, and of 6·71 per 1,000 females, in Leek. It may admit of doubt whether Macclesfield has increased at the same rate since as it did previous to the last census; therefore the diminution in the rate of mortality from these diseases may perhaps have been less than the above-named figures would indicate. It, however, appears certain that the public health of Macclesfield has greatly improved within the last few years, seeing that whilst the average annual numbers of births and marriages were almost identical during each of the periods of four years 1846-49 and 1855-58, the average annual number of deaths was nearly one-seventh less in the later than in the earlier of these periods. The decrease in the mortality from pulmonary diseases in Leek is so small, that the rates may be considered as having been identical in the two respective periods of seven and five years.

The mortality has not been equally distributed over either district, but has fallen with especial severity on the towns of Macclesfield and Leek, where the largest proportion of the inhabitants are employed in manufactures. The mortality from pulmonary diseases

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in the township of Macclesfield, which forms the east and west sub-registration districts of the Macclesfield Union, calculated on the assumption that the population has increased at the same rate since the year 1851 as during the preceding 10 years, was at the average annual rate of 7·43 per 1,000 males, and 8·13 per 1,000 females. The mortality in the sub-district of Sutton, where the manufacture of silk is also carried on, was at the average annual rate of 5·91 per 1,000 males, and of 6·86 per 1,000 females; and that of the remaining sub-districts at the rate of 4·43 per 1,000 males, and of 6·15 per 1,000 females, during the same five years. The mortality from pulmonary diseases in the sub-district of Leek, comprising the town of that name, during the last five years, calculated on the assumption that the population has increased at the former ratio, was at the average annual rate of 7·80 per 1,000 males, and of 8·51 per 1,000 females. That of the remaining sub-districts at the rate of 4·60 per 1,000 males, and of 5·13 per 1,000 females.

These rates are seen at a glance in the subjoined Table, together with those of the Northern and South-western groups of healthy standard districts:\*

AVERAGE ANNUAL NUMBER OF DEATHS FROM PULMONARY DISEASES in the Registration Districts of *Macclesfield* and *Leek*, in the Towns of *Macclesfield* and *Leek*, in the Sub-district of *Sutton*, in the Sub-districts of *Prestbury*, *Bollington*, *Rainow*, *Gawsforth*, and *Alderley*, of *Norton*, *Leek Frith*, and *Languor*, and in the Northern and South-western Healthy Standard Districts to each 1,000 Inhabitants of either Sex.

Name of District.	Per 1,000 Males.	Per 1,000 Females.
Macclesfield Registration District - - -	6·03	7·21
Macclesfield Town - - - - -	7·43	8·13
Sutton <i>Sub-districts</i> - - - - -	5·91	6·86
Prestbury, Bollington, Rainow, Gawsforth, and Alderley <i>Sub-districts</i> - - - - -	4·43	6·15
Leek Registration District - - - - -	5·53	6·71
Leek Town - - - - -	7·80	8·51
Norton, Languor and Leek Frith <i>Sub-districts</i> -	4·60	5·13
Six Standard Districts in Northumberland and Cumberland - - - - -	2·97	3·04
Ten Standard Districts in Devonshire and Corn- wall - - - - -	4·46	3·95

It thus appears that, if the outlying districts be excluded, and the mortality be calculated only for the towns of Macclesfield and Leek, in both of which the manufacture of silk forms the principal occupation of the inhabitants, the rate of mortality from pulmonary diseases in either sex approximates very nearly in the two places.

\* For an account of the standard rates, see the foot note on p.103.

The dwellings of the labouring population in Macclesfield and Leek require no particular notice. As in other towns, they are sometimes, but by no means generally, overcrowded. The rooms in some of the older cottages in Macclesfield are small; those used as sleeping apartments occasionally have no chimney, and sometimes the only means of ventilation is afforded by the opening of a single pane in the window. The recently built cottages are all of a very superior class. The windows are made to open freely, and sufficient cubical space is secured by the regulations enforced by the local authorities as regards the area and height of each room. There are not more than eight or nine cellar dwellings in the whole town, and these are but half under ground. Some of the houses in Leek, where unmarried factory operatives lodge, are said to be overcrowded at night. Many of the cottages of the operatives were visited, and it was found that the bedrooms in the smallest of them afforded, on an average, from 280 to 310 cubical feet of breathing space for each inmate. As in the older houses of Macclesfield, the sleeping apartments in the cottages of Leek are frequently destitute of chimneys, and the windows, opening but imperfectly, their ventilation is most inadequate: and yet, upon the whole, the dwellings of the labouring class in both towns are superior to those in many agricultural districts.

The mills of Macclesfield being subject to the supervision of the Factory Inspectors, and there being but little domestic manufacture in which the labour of young children can be made available, the latter are rarely employed, excepting in accordance with the restrictions laid down in the Factory Act. Very few "half-timers," *i. e.*, children whom the law only allows to work half the day, on condition that the remainder be spent in school, are employed in the mills of Leek; but a great number of very young children work at home, or in winding-rooms, or other work-places, which do not come within the jurisdiction of the Inspectors. In some of these places children are employed to turn the wheel that moves the machine, an employment at which they are engaged for at least 10 hours in the day. Thus, in a thread manufactory 24 women and girls were employed in the winding-room at the time of visit. The wheels that moved the winding-machines were turned by two boys, of the respective ages of 8 and 9 years; probably it would not pay to employ steam-power in so small an establishment; but its absence enables the proprietors of these small factories to escape the restrictions imposed by the Factory Act. About 21 persons were employed in another small winding establishment. The wheel was here turned by a man; but 10 little girls, some of them not more than eight or nine years of age, and only one or two as old as 11, were working 10 hours a day. In a third establishment of the same kind 18 or 20 of the operatives were girls between the ages of 8 and 12 years. Including men, women, and children, 51 operatives were here crowded into a space which, including that occupied by machinery, consisted of 10,000 cubic feet, thus affording an average of less than 200 cubic feet per head. The machines were moved by a wheel turned by a man: ventilation was most imperfect; in fact, practically, there was none, for the windows opened so

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exactly in a line with the heads of the workers, that they could not bear them open while at work: the duration of labour was 10 hours per day. There are many other work-places of the same kind in Leek, in each of which from five or six to a dozen persons are employed; but most of these places may be regarded as rather in the light of domestic work-rooms than of factories. The mill-owners of Leek will not, as a rule, employ children until they can work full time, nor even then, unless they have previously learned the business, either in the small factories or at home. Boys also are sometimes employed at an early age as helpers in the twisting sheds. Their employment here consists chiefly in running to and fro with the reels of thread, which most of them do, from preference, bare-fotted. The labour at first sight appears very great, as they seem to be almost constantly running backwards and forwards; but, on calculating the average distance traversed per day by the boys in two of these sheds, it did not exceed 10 miles. Of nine helping boys, whose ages were noted as fair examples of the system, three were not more than nine years of age; two 11 years; and the remaining five were of various ages, from 12 to 16 years. Thread-twisters generally begin work as helpers, and, when they have attained the age of 14 years, are put apprentice to the business. They are a short, stunted race, but, as far as could be ascertained, not subject to any special ailments. Mr. Heaton, one of the medical officers of the Leek Union, said that he had examined many recruits for the army, but rarely found the thread-twisters fit for service as soldiers.

The much larger rate of mortality from pulmonary diseases in the towns of Leek and Macclesfield, than in the other parts of those registration districts, seems fully to warrant the conclusion that some conditions associated with the silk manufacture are the causes of the high rate of death from those diseases in these districts. This conclusion derives additional support from the fact elicited by an analysis of the death registers. Although less than one-sixth of the men of Leek, above the age of 20 years were employed in the silk manufacture in 1851, one-fourth of the deaths of the men of that age, from pulmonary diseases, during the five years 1855-59, were those of men employed in the silk manufacture. The mortuary statistics of Macclesfield are less conclusive. The deaths of men who were employed in the manufacture of silk having been only 206 out of 570, or more than one-third; while the proportion of men engaged in that manufacture in 1851, was only 31 per cent., or rather less than one-third. On the other hand, it should be observed, that a much smaller proportion of the men of Macclesfield than of those of Leek are engaged in tilling the earth, and that a notable proportion are employed in cotton factories, in mining, in stone-quarrying, and other occupations of a more or less unhealthy nature. The deaths of young girls employed in the silk manufacture have been very numerous in both Macclesfield and Leek; but there are no accessible data from which to calculate the proportion their deaths bear to those of the rest of the population of the same age and sex.

Silk operatives are, for the most part, free from one cause which has been found to exercise a considerable influence in producing pulmo-



nary disease among some other classes of operatives. The only process of the silk manufacture of Leek and Macclesfield in which dust is evolved is the manufacture of silk waste, in which comparatively few persons are engaged. In several of the rooms of this kind of manufacture the operatives are liable to inhale a dusty atmosphere, and are said to suffer in consequence from pulmonary disease. This remark applies especially to the carding and "dressing" departments; but the operatives employed in the "sliver" and spinning rooms are also apt to suffer slightly from bronchial affections, in consequence of inhaling dust and flue. The manager of a mill of this class, in Macclesfield, said that some of the operatives cannot stand this branch of manufacture, and that many who try it are obliged to abandon the occupation on account of its injurious influence on their health. But few men are employed in the rooms where the cocoons are torn up, or the silk dressed; but of those seen, several suffered occasionally from the ill effects produced by inhaling dust. The operatives at a similar manufactory in Leeds habitually cover the mouth and nostrils while at work, in order to exclude the dust from the air passages. The quantity of dust in the atmosphere of the work-rooms is said to vary greatly according to the state of the weather. At Macclesfield it is endeavoured to withdraw the dust from the atmosphere of the work-rooms by means of open-mouthed, funnel-shaped shafts, placed over the dressing-frames, and connected with longitudinal flues, furnished with a fan, for producing an in-draught of air; but the contrivance is far from perfect. In Leeds the same object is attempted during winter, when the rooms can be less freely ventilated, and the dust in the air is more abundant, by means of small jets of steam injected into the atmosphere for the purpose of laying the dust; but the plan was not in operation at the time of the inquiry.

The influence of this branch of manufacture on the death-rate must, from the small number of persons employed in it, be insignificant; and the causes of the high rate of mortality from pulmonary diseases in Macclesfield and Leek is therefore to be sought in some other circumstances connected with the manufacturing operations of those towns. In a report on the sanitary condition of Leek, drawn up conjointly by the medical practitioners of that town, three years ago, it is stated as their opinion, that the imperfect ventilation of factories is at least one cause of the great pressure of pulmonary diseases on the population. Although no direct evidence of any relation between this evil and the prevalence of pulmonary diseases could be obtained in either Macclesfield or Leek, there seems no reason to doubt that to this, and perhaps also to the posture while at work of many of the operatives, the pressure of the above class of diseases on the population of these towns should be ascribed.

The ventilation of most of the mills in both towns is very imperfect; sometimes insufficient from defects of construction, it is still oftener imperfect owing to the arrangements being such that the openings for the admission of air cause draughts which, blowing directly upon the work-people, are apt to produce neuralgia or catarrhal complaints. On this account the ventilating openings in most of the mills are systematically closed during the hours of labour.

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The arrangements for ventilation generally consist of casements which either open outwards or hang suspended by the middle, upon a pivot. Either of these plans produces a draught of air which (as the openings are usually at the height of less than six feet from the ground) blows directly on the heads of the operatives; this is found intolerable, and thus, practically, there is no ventilation during the hours of labour. The casements are said to be usually set open at meal-times; but, as they are closed during the hours of labour, the operatives work in a stagnant atmosphere, often rendered more noxious by the number of persons collected in the same apartment. In one instance the so-called ventilating casements proved on trial to be so stiff from disuse, that they could not be opened.

In certain processes of silk manufacture a moderately elevated temperature is needed; but in the greater part of them there is no necessity for raising it beyond the degree requisite for the comfort of the workpeople. Notwithstanding this, the temperature of several of the mills, visited early in the day, was found to be as high as 70°, in one or two instances even higher; and, though the weather was fine, the windows were ordinarily covered with steam, produced by the exhalations from so many persons assembled in a limited space without adequate provision being made for ventilation. To strangers entering these work-rooms from the open air, the close atmosphere is very offensive, and even overpowering. The breathing space in these factory-rooms is generally sufficiently large if the air were not stagnant. The smallest amount of space per head met with was in an ill-ventilated factory at Leek, one room of which afforded only 225, and another 236 cubical feet per head, allowance not being made for machinery. One cause assigned by several of the medical men of Macclesfield and Leek, and also by some of the manufacturers, for the prevalence of pulmonary diseases among the silk operatives was, that working in close, hot rooms renders them very liable to catarrhal attacks. Often going out into the open air on their way to and from the mills very thinly clad, the factory workers are apt to take cold; in rainy weather they frequently get wet, and are then accustomed either to work in their damp clothing, or to dry it at the fire without taking it off. In winter the factories are warmed by hot-water pipes, which is probably the most convenient and economical mode, but is open to the objection that the air is apt to become too highly heated.

There are, as might be expected, some factories in which the ventilation is better arranged, and the above evils considerably mitigated. In one rather old factory at Macclesfield the windows opened inwards from the top, as far as the inner face of the wall, their further progress being prevented by a bracket, against which the window-frame rested; by this arrangement air was freely admitted through an opening the full breadth of the window, and about eight inches in depth; and, as it entered considerably above the heads of the operatives, and its current was directed upwards, no discomfort was experienced by the operatives. In another mill, at Leek, the mode of ventilation was similar, though less efficacious, and was in full operation at the time of visit. In two other mills the ventilation was found to be of the ordinary kind; but, instead of the casements



being made to open about the middle of the window, as is more usual, they were placed in the upper portion, thereby admitting the air at a considerable height above the operatives. In both mills the casements were found open at the time of visit; the rooms were cool, and the windows free from steam. The operatives in these mills were less pallid, and of a healthier aspect than most of their class. The town surveyor of Macclesfield said of one of these mills that the people prefer working in it to any other mill in the town, a circumstance which shows that the operatives do not object to well-ventilated work-places, provided they are free from draughts.

Both weavers and "piecers," *i. e.* the women and children who tie together the ends of silk which breaks while winding from the "swifts" on to the bobbins, work in a constrained position. Silk-weavers sit at their looms, with the body leaning forwards, and the lower part of the chest firmly pressed against the wooden beam on which their work is rolled, thus compressing both the stomach and chest; their arms are habitually brought forwards while at work, and they are thus apt to become round-shouldered and narrow-chested; some of them place a pad between the work and their dress, in order to prevent the silk from being injured. There appears to be no necessity for weavers sitting in this cramped position: some while at work sit in a more erect position than others, and some of these asserted that they could get through as much work as those who sit in a constrained posture. Many who weave figured fabrics requiring the use of several treadles, say they have not the necessary free use of the feet unless the body is partly supported by leaning against the beam; but this assertion was falsified by the practice of others who were observed to be working with several treadles without this support. Weavers, like many other operatives, are liable to suffer from working in close, ill-ventilated work-places, either in factories or at their own homes.

Piecers, and especially children, besides often working in badly ventilated rooms, stoop much at their work. They work in a standing position, and have a certain amount of exercise in moving backwards and forwards along the frame for the purpose of tying the broken ends, but, in doing this, they usually have occasion to stoop forwards. The precise influence of this position cannot be accurately estimated, seeing that it is associated with working in close, ill-ventilated rooms; but piecers appear from the death register to contribute an undue proportion of the mortality from pulmonary diseases. Much of the work on which piecers are employed is done at home, or in winding shops, not worked by steam power, and, in this case children of both sexes, but principally girls, are employed irrespective of the restrictions either as regards hours of labour, or the age at which they are put to work, imposed by the Factory Act. It was not possible to obtain any conclusive evidence of injury to health from this branch of labour by questioning the operatives; but it is always more difficult to elicit precise information on such subjects from female than from male operatives. Out of about fifty piecers and other female workers in the close rooms of several factories, whose evidence was taken, only eight or nine admitted that they suffered from pulmonary disease. The opinions of the medical men of both

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Leeds and Macclesfield coincided with the conclusions deduced from the death registers, and some of the manufacturers and the foremen of several mills said that the female operatives are very liable to diseases of the chest, and are frequently absent from their work by reason of illness. The overlooker in a silk mill at Brinscombe, near Stroud, reported, that the average number of female hands off work from sickness amounts to five per cent. The mill referred to differs in some respects from those of Leek and Macclesfield; but the operatives employed in it are exposed to influences precisely analogous to those which have been described as common in the latter towns.

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LEEDS, the capital of the great clothing district of Yorkshire, is rather the mart for the sale of its productions than the seat of the manufacture. Less than 17 per cent. of the men above 20 years of age in 1851 were employed in the manufacture of cloth. Being an exclusively urban district, a very small proportion, amounting to only  $2\frac{1}{2}$  per cent., of the men were, at the same rate, occupied in the cultivation of the soil. The manufactures of flax and silk, tanning, tool-making, and machine-making each likewise affords employment to a small proportion of the male inhabitants. The remainder are occupied in the ordinary pursuits of a large commercial town. Only  $3\frac{1}{2}$  per cent. of the women above the age of 20 years were employed in the manufacture of cloth in 1851; but a larger proportion worked in the flax mills, and others find employment in various other factories and establishments where female labour is in request. A large, but unknown proportion of young people of both sexes are also employed in the various manufacturing operations of the town.

The inhabitants of Leeds died from pulmonary diseases during the septennial period 1848-54 at the average annual rate of 8·17 per 1,000 males, and of 7·18 per 1,000 females. If the population have continued to increase since 1851 at the same rate at which it increased during the ten years immediately previous to the last census, the average annual rate of mortality from the above diseases during the five years 1855-59 has been 8·11 per 1,000 males, and 7·12 per 1,000 females. These rates may be considered as identical with those of the earlier period. The information obtained at Leeds in relation to the influence on health of the manufacture of flax, silk and tools, has been already used in the reports on these several branches of manufacture.

The several sections of the population of Leeds are exposed to various conditions, which inquiry in other places has shown to be associated with an excessive pressure of pulmonary diseases upon the inhabitants. Leaving the operatives employed in the woollen manufacture to be considered, together with those of the other districts named at the head of this paper, some of the artisans employed in the tool manufactories and in grinding materials for dyeing; some of the operatives in the flax and silk mills, and probably other workpeople, are liable to bronchial irritation from inhaling dust while at work; others from working in close, ill-ventilated, and sometimes over-



crowded workshops, or from living in close, ill-ventilated or overcrowded dwellings, are exposed to influences different, it may be, in degree, but similar in kind to those experienced by the silk operatives of Macclesfield and Leek; and, lastly, various other conditions of a town population, such as sedentary habits, and the habitual breathing of an atmosphere loaded with the products of combustion, are likely either to augment the frequency, or, at least, to aggravate the severity of diseases of the lungs; catarrhal affections especially which, under more favourable circumstances, would speedily disappear, are apt to be protracted, and become chronic, under the influence of some of the conditions here mentioned. It would clearly be almost impossible to apportion to each of these various conditions its separate influence in producing the high rate of death from diseases of the lungs in the same place; but Leeds afforded a good field for inquiring into the circumstances connected with several of the above-named branches of manufacture, and also their influence on the health of individual operatives.

Although the woollen manufacture is the principal occupation of the inhabitants of Bradford, the fabrics manufactured there are very different from those of Leeds. Woollen cloth is made in the latter, stuff and worsted articles in the former district; one difference between the manufacture in the two places is, that short wool is used in the manufacture of cloth, long wool in that of worsted; but, perhaps, the greatest distinction is found in the fact that in the manufacture of worsted the wool is combed, so that its fibres lie evenly in a longitudinal direction, whilst in the manufacture of cloth it is simply carded, and the fibres are allowed to interlace one another. About 42 per cent. of the men of Bradford above the age of twenty years were employed in the staple manufacture of the district in 1851; 6 per cent. were miners and iron manufacturers; nearly  $4\frac{1}{2}$  per cent. were stone-masons and quarrymen; a small proportion were machine-makers, and about 6 per cent. were occupied in the cultivation of the soil. Nearly one-third, or 30 per cent., of the women of Bradford, and a large, but uncertain proportion of young people of either sex, were employed in the stuff and worsted factories of Bradford in 1851.

Bradford is much less exclusively an urban district than Leeds; but the woollen manufacture more or less prevails throughout the registration district, of which the town of Bradford is the centre. The inhabitants of Bradford died from pulmonary diseases during the septennial period 1848-54 at the annual average rate of 6.11, per 1,000 males, and of 6.03 per 1,000 females. The population of Bradford increased very largely during the 20 years previous to the last census. It is doubtful whether the population has increased quite so rapidly since that period; but, assuming it to have done so, the average annual mortality from pulmonary diseases during the five years 1855-59, has been at the rate of 5.44 per 1,000 males, and of 5.55 per 1,000 females. This would show a decrease of mortality which, in a population of more than 200,000 persons, would amount to more than 120 lives per annum. It is very probable that the mortality has really decreased, recent improvements in the mode of combing wool having nearly removed a very powerful cause of bron-

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chial disease, to which a large section of the men especially were exposed, but from which women and children occupying the same houses were not entirely exempt. In Bradford, as in other large towns, the dwellings of the working class are diverse in character; but those visited were, on the whole, above the average of those in some other factory towns. Strumous diseases are said to be very common in Bradford. Mr. Poppleton, one of the certifying surgeons to factories, reported, that the operatives are badly fed; that the factory girls more particularly subsist chiefly on tea and bread, rarely tasting meat; and that the population is degenerating, the men being shorter in stature than formerly. This statement was confirmed by Dr. M'Turk, who alleged that the surgeon who examines recruits finds the men now presented for examination are shorter than they used to be. Exposure to considerable alternations of temperature was also one of the causes assigned by the medical men for the prevalence of pulmonary diseases among the operatives of Bradford. The truth, however, is, that the operatives do not experience a larger rate of mortality from pulmonary diseases than the rest of the community. Of the several classes of workpeople in Bradford, the pressure of these diseases would seem to fall most heavily on quarrymen and masons, seeing that although in 1851 this latter class only constituted 4·7 per cent. of the adult male population, 6·3 per cent. of the deaths of adult males from pulmonary diseases during the last five years have been those of men engaged in the above branches of labour; the numbers, however, are evidently too small sensibly to affect the rate of mortality among the entire population.

Stroud and Melksham, the latter including the town of Trowbridge, are among the places in the west of England which have long been famous for the manufacture of superfine broad cloth. The registration district of Stroud is hilly, the population being principally located in narrow valleys: it comprises the towns of Stroud and Minchinhampton, but the cloth manufacture prevails throughout the district, and mills are to be found in most of the outlying villages and hamlets. One-fifth or 20·8 per cent. of the men, and one-fourth or 25 per cent. of the women, of Stroud, above the age of 20 years, were occupied in the cloth manufacture in 1851. Nearly 23 per cent. of the men were at the same date engaged in the cultivation of the soil. The mortality from pulmonary diseases in Stroud during the septennial period 1848-54 was at the annual average rate of 5·11 per 1,000 males, and of 5·11 per 1,000 females. The population had rather decreased during the 20 years anterior to 1851, and may be assumed to have been almost stationary since that date. On this supposition the mortality from the same diseases during the five years 1855-59 had been at the average annual rate of 5·36 per 1,000 males, and of 5·50 per 1,000 females.

The climate of Stroud is humid and variable, and the ranges of temperature are very great. The narrow valleys are hemmed in by lofty hills, and fogs, which lurk in the low grounds while the hills remain free from them, are of frequent occurrence. The operatives often walk a considerable distance to and from their labour; and it was stated by Dr. Payne, physician to the Stroud General Hospital, that he believed phthisis and other pulmonary



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diseases to be less prevalent among such persons as are much in the open air than among those who are constantly confined to their workshops. Scrofula and gœitre are common diseases in the district. The dwellings of the working class in Stroud are for the most part tolerably spacious, and in general well ventilated; but in the more distant hamlets, the cottages are said to be often badly constructed, damp, and over-crowded. The population is not densely located on the surface of the earth in any part of Stroud. Several other manufactures besides that of cloth give employment to the inhabitants of Stroud, some of which are said to excite pulmonary disease. There are many flour-mills in the district, and likewise some manufactories of walking-sticks, and handles for umbrellas, parasols, and steel-pens. Dust in large quantities pervades the atmosphere of some of the rooms in these factories, and both the workpeople employed in them, among whom are included many children, and the millers, are liable to suffer from bronchitis. In Stroud there are also many stone-masons and quarrymen, and a few men who make it their business to go from mill to mill for the purpose of dressing the stones. These are all said to be subject to bronchitis. Stroud contains also a steam machine-sewing factory, which affords employment to a large number of women and children; the occupation is of a sedentary kind; and though much care has been bestowed on the ventilation, it is still imperfect, and the workers are much more crowded than is common in other kinds of factories. Although the persons employed in these several occupations do not, in the aggregate, form a large percentage of the population, their deaths serve to swell the mortality from pulmonary diseases. The intermarriage of blood relatives is said to be frequent in some parts of the district, and was especially referred to by Mr. Holbrow, a medical practitioner of Stonehouse, as being, in his opinion, a chief cause of the prevalence of phthisis.

The registration district of Melksham comprises the sub-districts of Melksham and Trowbridge, each containing a town. The town of Melksham contained a population of 2,931 persons, that of Trowbridge of 10,157 persons, in 1851. At the same date 30 per cent. of the men of the registration district aged 20 years and upwards, and nearly 29 per cent. of the women, were engaged in the manufacture of woollen-cloth, and 15·7 per cent. of the men were employed in the cultivation of the soil. A large, but uncertain proportion of young people of both sexes under 20 years of age are also employed in the manufactures both of Stroud and Melksham. The woollen manufacture in the registration district of Melksham is now entirely restricted to Trowbridge, the last factory in Melksham having been closed a few months previous to the present inquiry. Both Melksham and Trowbridge are low and damp, the former being situated near the River Biss, and the latter closely adjoining the Avon. The inhabitants of the registration district of Melksham died from pulmonary diseases during the septennial period 1848-54 at the average annual rate of 6·26 per 1,000 males and of 5·59 per 1,000 females; the population had fluctuated but little during the 20 years anterior to 1851, and may be considered as being stationary. On this assumption, the mortality from the same class of diseases during the five years 1855-59 has been at the average



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annual rate of 6·14 per 1,000 males, and 7·10 per 1,000 females. The deaths have not been equally distributed over the district, having been more numerous in proportion to its population in Trowbridge than in Melksham; in the former the mortality has been at the rate of 6·48 per 1,000 males, and of 7·40 per 1,000 females; in the latter of 5·60 per 1,000 males, and of 6·55 per 1,000 females.

The clerk to the Board of Guardians, and the medical men both of Melksham and Trowbridge, said, that bronchitis is so prevalent, that it may be regarded as endemic in the district. This statement does not apply merely to the aged, with whom bronchitis is everywhere a common disease, but also to persons in middle life. The reasons assigned for the frequency of bronchitis were, the dampness both of the soil and dwellings, and the exposure of the operatives to alternations of temperature. The dwellings of the working classes in Trowbridge are said to be of fair character, but sometimes overcrowded, and the ventilation of the sleeping apartments in general defective: many of the houses in Melksham are ill ventilated, and the apartments small.\* Cottages were visited in which the cubical space of the principal apartment did not exceed 900 or 1,000 cubic feet, and the bed-rooms were even smaller. Mr. Stapleton, the certifying surgeon for factories at Trowbridge, and also one of the parochial medical officers, said that he had found recruits for the militia from that neighbourhood inferior in both strength and stamina to those from the agricultural parts of the county.

On classifying the men who have died from pulmonary diseases in Bradford, Stroud and Melksham according to their occupation, it does not appear that the manufacture of woollen fabrics, speaking generally, is especially apt to produce those diseases. Although in Bradford about 42 per cent. of the men were employed in the woollen manufacture in 1851, a proportion which is probably still maintained, only 40 per cent. of the deaths of men during the five years 1855-59 were those of woollen operatives, being a rather smaller proportion than would have been the case had the mortality been equally distributed among the population. In Stroud little more than 19 per cent. of the deaths of adult males were those of men employed in the manufacture of cloth, though 21 per cent. of the men above the age of 20 years were engaged in this manufacture in 1851. The proportion has been larger in Melksham, where 34 per cent. of the deaths of males over 20 years of age from pulmonary diseases were those of men employed in the woollen factories, whereas only 30 per cent of the men were employed in this manufacture in 1851. It is worthy of note, that many of the factories of Trowbridge, in which steam power is now used, were erected previous to its employment in

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\* Formerly fever prevailed annually in the town of Melksham. The house-drains were then, as they still are, all connected with a sewer running the entire length of the town; but the declivity of the sewer is so slight, that the sulliage did not flow away. There were also many stagnant ditches in the immediate vicinity of the town; the latter have been nearly all cleansed and covered, and permission having been obtained from the canal company, the surplus water from the canal is allowed to flow through the sewer, so that there is now a constant stream passing through it, and preventing the accumulation which formerly took place. Four years have elapsed, since these improvements were effected, without the recurrence of fever, although during these years this disease has been unusually rife in many parts of the country.



clothing mills. It is impossible to estimate correctly the proportion of female factory operatives who have died from pulmonary diseases, seeing that females are generally described in the death registers under the calling of their parents or husbands, rather than that which they themselves followed.

It is evident, from the above facts, that the employment of a considerable portion of the inhabitants of these places in the woollen manufacture is by no means the sole cause of the high rate of mortality from pulmonary diseases among the inhabitants. But, although this is true, in general terms, of the woollen manufacture, the latter, nevertheless, includes several processes in which dust and fine particles of wool are dispersed in the atmosphere, and one especially, wool-combing by hand labour, in which there is a combination of circumstances prejudicial to health: many of the operatives are likewise exposed to conditions which in other districts have been found associated with an excess of pulmonary disease, such as working in ill-ventilated and over-heated rooms.

There is a much greater variety of processes in the woollen manufacture than in that of any other of the textile fabrics. It is unnecessary to notice all of these, but two or three of them must be briefly described.

Wool-combers, as the term implies, comb the wool, so that the fibres shall be arranged in the even parallel manner required for spinning worsted. Long metal combs are employed for this purpose, and, as they must be used warm, they are heated in a pot or furnace, in most cases containing charcoal, but sometimes coke or coal. The hand-combing at Bradford is done entirely at the homes of the men, who sometimes work in a cellar, at others in the house. In the latter case their wives and families are, of course, exposed to the same unhealthy influences as the men themselves. The furnaces for heating combs very rarely have any flue or covering, the products of combustion being evolved into the atmosphere of the apartment, which is almost always over-heated. Wool combers admit as much air as possible into their work-rooms in fine weather, and are, therefore, much exposed to draughts. A little fine dust is given off from the wool in the process of combing, the inhaling of which, and of the products of combustion from the furnace, is apt to cause pulmonary disease. The process of hand-combing is now almost entirely superseded by machinery, and it was not without difficulty that a few hand-combers could be discovered in order that the old method of combing might be seen. Wool-combers formerly constituted a very numerous class of operatives in Bradford; but no separate mention is made of their number in the Census Report. They are said to have formerly amounted to many thousands; but a great many having turned to other kinds of labour, their number is now supposed not to exceed 500. In this uncertainty as to their number, it is impossible to estimate correctly the rate of mortality among the wool-combers, but the deaths of 182 of them from pulmonary diseases are recorded in the death registers of Bradford for the last five years. Of the few seen, only one pronounced himself to be healthy; the others all suffered from chronic bronchitis; but these were for the most part old hands.

The operatives employed in wool-combing by machinery are,

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comparatively speaking, few in number, one man being able to manage a machine which does as much work as formerly employed many hand-combers. Machine combing is done at the factories in rooms greatly superior to the close places in which wool-combers formerly worked, and the latter are no longer exposed to inhale the fumes of charcoal, though the temperature of the work-places is still rather high, that of one of the largest and best ventilated standing at 76° at the time of visit in the early part of the day.

Wool-sorters separate the fleeces, and divide the wool of each, according to its fineness, into several qualities. A considerable quantity of dust is sometimes given off in this process, the men's coats being often covered with it. The amount varies greatly according to the kind of wool. There is much dust in mohair and alpaca; Australian and Cape wool also contain a large quantity of dust, which has collected in the fleece before its removal from the sheep. Next in order comes Saxony wool; and, lastly, English, which is the cleanest of any. Lamb's wool, as might be expected, contains very little dust. Foreign and colonial wool is brought to this country in bales or packs, in which the wool is so closely matted together, that it is difficult to separate it. The dust given off in wool-sorting is apt to cause slight bronchial irritation, which becomes worse as the sorters advance in life; but the disease is of slow progress, and the men are generally ailing for many years before they finally break down. Wool-sorters employed upon Australian, or very dusty wool, sometimes, while at work, cover the mouth with a handkerchief. No such conclusive evidence of the injury to health from inhaling dust was obtained among the wool-sorters as among the miners, grinders, and flax-dressers, but the occupation was reported, both by the manufacturers and operatives, to be an unhealthy one; and though men advanced in life were found working at it, many of the wool-sorters said that they suffered more or less from bronchial irritation produced by inhaling the dust. The wool-sorters form only a small class, but their number being unknown, it is impossible to estimate correctly the rate of mortality among them from pulmonary diseases. Only 42 deaths of men from this class of diseases in Bradford are entered in the register as having been those of wool-sorters during the last five years.

Willying, teasing, scribbling, and carding, are processes employed for the purpose of opening out and cleansing from dust wool to be employed in the manufacture of cloth. Much dust is evolved in the two first of these processes; but the machines being covered, and the dust drawn away into a flue connected with a fan, which produces a powerful indraught, but little of it escapes into the atmosphere of the work-room. After being willyed and teased, the wool is plentifully sprinkled with olive oil before it is placed in the scribbling machines. Although a small quantity of fine filamentous particles of wool is diffused through the atmosphere of the scribbling and carding rooms, the operatives, chiefly young women and girls, employed in supplying the machines with wool, so far from suffering, seem to improve in health from their occupation. Their arms are covered with oil from handling the wool up to the elbows, and, though dirty in appearance from the nature of their occupation, they are almost without exception robust,



and form by far the healthiest looking of all classes of factory operatives. This remark applies to the scribblers in every district of woollen manufacture which was visited, including Leicester, where a small proportion of the people are employed in worsted spinning. Scribblers often present a favourable contrast to the weavers and other female operatives working at the same mill; and women who have formerly been scribblers may often be recognized among their companions while at work in other departments of the manufactory. An impression prevails generally throughout the woollen districts that the oil employed in the manufacture is conducive to health. Mr. Rickards, Sub-Inspector of Factories for the Leeds District, reported, that it is common for parents to send weakly children, especially if their delicacy be of a phthisical kind, to the woollen mills, in the belief that the oil will serve as a prophylactic against their constitutional tendency. Scribbling rooms must be kept at a moderately elevated temperature, in order to preserve the oil perfectly liquid. The temperature varies in different mills according to the care bestowed on the ventilation. That in a scribbling room of one of the first mills at Leeds was only 64°, while in others it was as high as between 70° and 80°.

A little filamentous flue and dust is given off from the wool in spinning-rooms; but the quantity is insignificant, and does not, in general, appear to be injurious to the health of the operatives. The same remark applies to the rooms in which the nap is cut after being raised in the "gigs," or teasel machines.

The woollen manufacture includes processes for utilising and working up again wool that has already been manufactured into cloth. The manufactures of mungo, shoddy, and flock, have thus become distinct branches of trade. The atmosphere of the room in which woollen rags are passed through the "devil" in the manufacture of mungo and shoddy is said to have been formerly much loaded with dust; but the same means being now adopted to prevent its dispersion as are used in the wilying rooms of ordinary woollen factories, the occupation may now be regarded as perfectly healthy. This remark does not apply to mills for the manufacture of flock, in which woollen and cotton rags, after being torn into fibres in a machine under water, and afterwards dried, are passed through a carding machine. Much dust is created in this latter process, and the operatives in a flock mill at Brinscombe, near Stroud, had a sickly aspect, though they represented themselves to be healthy. Comparatively few operatives are employed in this branch of manufacture.

Woollen factories differ much in construction. In some of them the rooms are lofty, well ventilated, and cool; in others they are low, imperfectly ventilated, close, and hot. The operatives in the latter, more particularly those who, like the weavers, burlers, reelers, and nap-cutters, lead a sedentary life, or are collected in considerable numbers in the same room, are exposed to influences similar to those of the operatives of Macclesfield and Leek. They often have an unhealthy aspect, and the children especially, who work in such rooms, exhibit a sickly, pallid countenance, unknown in mills of a better construction. These evils are much aggravated in winter by the mode of heating by means of pipes of hot water or steam, and by the combus-

## Appendix.

### VI. Excessive mortality from lung-diseases.

#### Woollen districts.

Leeds.  
Bradford.  
Stroud.  
Melksham.



## Appendix.

VI. Excessive  
mortality from  
lung-diseases.Woollen dis-  
tricts.Leeds.  
Bradford.  
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tion of gas during several hours daily. It was found impossible to obtain direct evidence in the woollen districts of the relation between the existence of these evils and of pulmonary disease; but if it may be permitted to judge from analogy, there seems little doubt that they ought to rank among the principal causes of the high rate of mortality from these diseases among the woollen operatives; for though these operatives do not contribute more in proportion to their numbers than the other inhabitants of these districts to the mortality from pulmonary diseases, their rate of mortality is yet greatly in excess of the normal standard.

8. LEICESTER and HINCKLEY.—*Hosiery Manufacture.*Hosiery dis-  
tricts.Leicester.  
Hinckley.

LEICESTER is altogether an urban, Hinckley chiefly a rural district, only two-fifths of the inhabitants of the registration district having dwelt in the town of Hinckley in 1851. The manufacture of hosiery forms the sole manufacturing employment of the inhabitants of Hinckley, and the principal, though not the exclusive, employment of those of Leicester.

The district of Hinckley includes the town of that name, and the villages of Earl Shilton and Burbage, besides several rural parishes. The town of Hinckley stands on rising ground; the situation is dry, the subsoil consisting of sand or gravel, and fogs are not of frequent occurrence. The town consists of several tolerably broad streets with numerous courts and lanes, and its site is not densely covered with buildings. The villages of Earl Shilton and Burbage\* are likewise on elevated ground, and the latter especially is in a bleak exposed situation. The manufacture of hosiery prevails throughout the district. Until very recently this was altogether, and still is principally, a domestic manufacture; but within the last six or seven years several small factories have been established in Hinckley and Earl Shilton, in which steam power and modern machinery have been introduced in place of the old knitting frame. Nearly 44 per cent. of the men, and 42·5 per cent. of the women, above the age of 20 years, were employed in the manufacture of hosiery in 1851. About 24 per cent. of the men were at the same date occupied in the cultivation of the soil. The agricultural and manufacturing classes are closely intermingled, different members of the same household

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\* Out of a population of about 2,000 persons resident in Burbage, 500 suffered from typhoid fever three years ago. The village is high, exposed, and bleak; many of the dwellings are said to have been overcrowded, and dirty both within and without at the time of the outbreak. The cottages are frequently small, and those in a row, consisting of 14 in number, where the fever began, are still in an unsatisfactory state as regards their sanitary condition. The outbreak was very sudden. It began, said Mr. Ludlow, one of the medical practitioners of Hinckley, in the last week of August 1857, when 50 cases occurred almost simultaneously. At the end of a week the cases amounted to 90, and in a fortnight to 173 in number. In Crossland's-row, where the disease first showed itself, there were 44 cases, as many as seven or eight sometimes occurring in a single house. The water supply of that part of the village is obtained from a public pump near to the church, so situated that contamination of the water with organic impurity seems improbable. Several of the inhabitants of Crossland's-row and its neighbourhood attributed the outbreak to the foul condition of some drains, and to the circumstance of a cesspool having been lately emptied, and the soil left lying for many days on the surface of the ground; but the village is long and straggling, and cases of fever occurred in houses much too remote from the alleged cause to allow of our referring them directly to it.



often following these branches of labour. The mortality from pulmonary diseases in Hinckley during the septennial period 1848-54 was at the average annual rate of 6·52 per 1,000 males, and of 6·03 per 1,000 females. The population of the district had slightly decreased during the 10 years previous to the last census, and, judging from the average annual number of births, marriages, and deaths during the last 10 years, has probably rather decreased than increased since that time. Assuming the population to be the same as in 1851, the mortality from pulmonary diseases during the five years, 1855-59, has been at the average annual rate of 5·17 per 1,000 males, and of 5·76 per 1,000 females, numbers which, though somewhat more favourable than the former, are still considerably in excess of the standard rate. Stocking makers are a pale, sickly-looking, slightly-built race of men, of short stature, and are said to intermarry very much among themselves, marriages of consanguinity being of frequent occurrence. As in all employments which can be followed alike by women and men, the earnings of stocking weavers are small, and, as a class, they are, in consequence, badly fed. Strumous diseases are said by the medical men to be very common. Both phthisis and bronchitis are prevalent, and Mr. Spencer, of Earl Shilton, who is medical officer for a district in both the Hinckley and Market Bosworth Unions, said that he had observed a notable difference in the comparative prevalence of pulmonary diseases in the two places. The population of Market Bosworth is entirely agricultural, and the people are much more robust and less subject to these diseases than those of Earl Shilton, the greater part of whom work at the stocking frame.

The manufacture being so largely of a domestic kind, the greater part of the population are more or less exposed to any injurious influences which may arise from it; nevertheless the mortality has fallen somewhat more severely on the stocking weavers than on the rest of the community. Out of 118 deaths of men above the age of 20 years from pulmonary diseases during the last five years, 58, or about 50 per cent., have been those of stocking-makers, who yet formed rather less than 44 per cent. of the adult male population in 1851. The deaths of women being generally recorded in the death register under the description of their fathers or husbands, it is impossible to ascertain the comparative pressure of pulmonary diseases upon the female stocking-makers.

In such factories as have been recently constructed, the work-rooms are, for the most part, lofty, and tolerably well ventilated; indeed the machines now used in these factories require that the rooms should be of a good height. Wherever old houses have been converted into workshops, as is sometimes the case in certain branches of the manufacture, such as the rooms used for cutting out, mending, welting, and finishing, the ventilation is defective, and the work-places are often over-crowded. In one of the best of these rooms the breathing space per head did not exceed 260 cubic feet. These factories are said not to be under the jurisdiction of the Factory Inspectors, though they afford occupation to many women and children, and are worked by steam power. The amount of work executed in the factories at Hinckley is, however, small in comparison

## Appendix.

### VI. Excessive mortality from lung-diseases.

Hosiery districts.

Leicester.  
Hinckley.



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mortality from  
lung-diseases.Hosiery dis-  
tricts.Leicester.  
Hinckley.

with that done in the dwellings of the operatives: the latter work on the old knitting-frames, which are usually set up in small shops, but sometimes in the cottages. These workshops are often very small, and are seldom properly ventilated. One of these workshops, in which seven operatives, viz., four men and three women, besides a girl who was winding, were at work at the time of visit, afforded only an average space of 150 cubic feet per head, no allowance being made for the machinery and the persons in the room. This may be considered an extreme case; but the manufacturer who employed these people said that the workshops were formerly all crowded in the like manner. In another cottage, where the frame was placed in the sitting room, the size of the latter scarcely amounted to 800 cubic feet. In a third cottage, where four men were at work, the average amount of space per head in the workshop was only 155 cubic feet; but the door communicating with the adjoining room was open, and the latter contained about 800 cubic feet of space. In other workshops the average space per head of the persons at work at the time of visit did not exceed 160, 190, 200, 260, and 300 cubic feet. There are many larger shops, originally designed for a greater number of frames than are at present worked in them, where the breathing space is of course now more in accordance with the requirements of health. These workshops are sometimes ventilated indirectly through the adjoining houses; but where several persons, not members of the same household, worked together, the door of communication was generally found to be closed. At Hinckley cotton stockings chiefly are made, and a small quantity of flue is given off in the process. This is not perceptible in the air, but may be seen where it has settled on the frames and other flat surfaces, and its existence in the atmosphere of the place is assigned by the medical men as one of the causes inducing pulmonary disease among the operatives. The hours of labour in the private workshops of Hinckley are long; the knitters commonly begin work at six or seven o'clock in the morning, and the noise of their frames may be heard in almost every part of the town till nine or ten at night; they are said to work little on the Monday and early part of Tuesday, but to make up for this by working long hours during the remainder of the week.

Leicester lies in a valley, and is surrounded on all sides by hills. The descent of the valley is inconsiderable, and the lower parts of the town are liable to floods, which have become much less frequent since the drainage of the town. Fogs are of frequent occurrence. The town stands partly on gravel, partly on clay; it is not densely built, and the streets are generally wide, cleanly, and well kept. The houses of the labouring class in the older parts of the town are often confined, ill ventilated, and over-crowded. Those of recent construction, having been built according to regulations enforced by the local Board of Health, are superior to the average class of operatives' dwellings in most manufacturing towns. The manufacture of hosiery and worsted gave employment in 1851 to 30·5 per cent. of the men, and to 11 per cent. of the women, above the age of 20 years. About four per cent. of the men were at the same date occupied in the cultivation of the soil. Since that period a material change has taken place in the occupations of the inhabitants of Leicester: the



manufactures of elastic web and of shoes having become developed into important branches of trade, affording occupation to a large number of operatives. There are also several thread-winding factories, besides dyeing and bleaching works. A large, but uncertain proportion of young persons of both sexes are employed in these different branches of industry.

The manufacture of hosiery was formerly chiefly carried on in small workshops, or in the dwellings of the operatives; but within the last 10 years the factory system has been increasing rapidly, and the manufacture is now said to be divided about equally between the factories and the private workshops. The latter are said to have been much improved within the last 20 years, and it is supposed that the gradual introduction of better machinery will, at no distant date, require that all the work places should be made of greater height, and therefore more airy, and less likely to prove injurious to health, than was the case under the old system.

The mortality from pulmonary diseases in Leicester during the septennial period 1848-54 was at the average annual rate of 7.40 per 1,000 males, and of 6.59 per 1,000 females. Assuming the population to have increased at the same rate since 1851 as during the preceding 10 years, the mortality from these diseases during the five years 1855-59 has been at the average annual rate of 6.23 per 1,000 males, and 5.90 per 1,000 females. The stocking-makers of Leicester, like those of Hinckley, are a stunted, slightly made, pale, sickly looking race. Out of 583 deaths of men above the age of 20 years from pulmonary diseases during the last five years, 190 or 32.3 per cent. were those of operatives employed in the hosiery and woollen manufacture: this shows only a small excess of mortality above that of the rest of the population, if this class of operatives constitutes the same proportion of the men as it did in 1851; but the excess is in all probability really somewhat larger, seeing that many of the stocking-makers have abandoned their old occupation, and become shoemakers. Operatives who work in the hosiery and other factories of Leicester, are subject to influences akin to those which have already been referred to in describing other manufacturing districts; such, for instance, as working in ill-ventilated, over-heated rooms, especially at night, when lighted with gas; they thus become liable to suffer from exposure to the cold external atmosphere while heated and fatigued, and often insufficiently clothed. The weaving and stocking machine rooms of the factories are generally of ample size, but sometimes imperfectly ventilated. The warehouses, in which a large number of young women are employed, are in general well ventilated, and probably never overcrowded; but the rooms become very hot in the after part of the day, especially in winter, when lit up with gas. The winding and work-rooms in which many young women and girls are collected at a sedentary occupation, are probably, as regards risk to health, the most objectionable part of the factory system of Leicester; and though it is impossible to estimate accurately the extent of their influence, it is probably great in the causation of pulmonary disease: these rooms are often overcrowded, and, for the most part, imperfectly ventilated. Ample means of ventilation are indeed often provided, but they are frequently of a nature to annoy the operatives, and, with very few exceptions, were

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### VI. Excessive mortality from lung-diseases.

#### Hosiery districts.

Leicester.  
Hinckley.



## Appendix.

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tricts.Leicester.  
Hinckley.

not found in operation at the time of visit. The cubical capacity of many of the rooms is very deficient: the two largest noted afforded from 350 to 400 cubic feet of breathing space to each inmate, which is ample, provided there be free ventilation; but others afforded only 175, 220 and 257 cubic feet of space per head. From 20 to 40 or 50 women and girls are collected in each of these rooms, many hundred females being thus employed in Leicester. The bye-laws of the Local Board of Health\* require every new shop and factory to be "supplied with means of ventilation to be approved by the local Board;" but the means usually adopted are of a kind to produce draughts annoying to the operatives, and whenever this is the case, the provision for ventilation in Leicester, as in other factory towns, becomes practically inoperative.

The domestic workshops in which the stocking-frame knitters work are, for the most part, imperfectly ventilated, and sometimes much overcrowded and deficient in cubical capacity. Newly constructed workshops come within the above-mentioned bye-law of the Local Board of Health, and none were seen in which the breathing space was so limited as in the workshops of Hinckley. The smallest of these shops visited afforded the operatives 200 cubic feet of breathing space per head; in fact, considering that Leicester is a large town, and Hinckley an almost rural place, the former contrasts not unfavourably with the latter as regards the rate of mortality from pulmonary diseases. In all probability, if it were possible to calculate it correctly, it would be found that the operatives of Hinckley die at a larger average rate from these diseases, in proportion to their number, than those of Leicester, where especial attention is devoted by the authorities to promoting the public health.

9. PRESTON.—*Cotton Manufacture.*

## Cotton district.

## Preston.

ALTHOUGH the cotton manufacture is the chief occupation of the inhabitants of Preston, several others, such as the flax and woollen manufactures, afford employment to many of the people. The town likewise contains several iron foundries and workshops for constructing steam-engines. About 31 per cent. of the men, and 28 per cent. of the women, above the age of 20 years, were employed in the cotton manufacture in 1851. This is exclusive of a very large, but unknown proportion of young persons, especially females, under the age of 20 years, who also find employment in the cotton factories. The mortality from pulmonary affections among the inhabitants of Preston during the septennial period 1848-54 was at the annual average rate of 7·76 per 1,000 males, and of 7·68 per 1,000 females. The population had increased about 25 per cent.

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\* *Copy of Bye Law.*—Every new public building and school, and also every shop and factory, now erected, or to be erected, shall be supplied with means of ventilation to be approved by the local Board; and every room in any house or other building now erected, or to be erected, which shall be used as a day school, shall, unless supplied with special means of ventilation to the satisfaction of the local Board, be so used subject to the following regulations (namely), if the room shall be less than 8 feet 6 inches in height from the floor to the ceiling, the space for each scholar shall be 9 superficial feet at the least; and if such room shall be 8 feet 6 inches or upwards in height, the space for each scholar shall be 8 superficial feet at the least; and any person who shall violate or offend against this bye-law is liable to a penalty of not exceeding 5 *l.*, and a further sum not exceeding 40 *s.*, for every day during which such violation shall continue.



during the 10 years antecedent to the census of 1851. If it has gone on increasing at the same rate since that date, the mortality from pulmonary diseases during the five years 1855-59 has been at the average annual rate of 8·12 per 1,000 males, and of 8·01 per 1,000 females. These figures only fractionally exceed those which represent the rate of mortality during the earlier period; and as they have been deduced from an estimated population, the rate may probably be regarded as about the same for both periods. Males and females have died very nearly at the same rate at both these times, the difference of rate being too small to be considered of any importance. The death registers do not supply any satisfactory evidence respecting the causes of the high rate of mortality from pulmonary diseases in Preston. The men employed in the cotton factories do not appear to lose a larger proportion of their number from these diseases than the rest of the community. The occupation of females being rarely stated in the death register, it is impossible to ascertain by the aid of statistics the pressure of these diseases upon different sections of the female population; but it was stated as their opinion by several medical men of Preston, more particularly by Dr. Fearnside, and by Mr. Howitt and Mr. Moore, certifying surgeons under the Factory Act, that the female operatives of the cotton mills are very liable to pulmonary diseases, in consequence of frequent exposure to sudden and great transitions of temperature in passing to and from their homes and the factories. The factory girls, it is said, are also ill-fed, their chief subsistence being tea or coffee, and bread: they are likewise thinly-clad. Several medical practitioners also attributed the prevalence of pulmonary diseases to the cold climate, and the frequency of bleak winds. This opinion, however, may be doubted, seeing that the site of Preston is dry, and that the rate of mortality from pulmonary diseases is much lower in the outlying portions of the district than in the town. Supposing that the population have increased at the same rate in each sub-district since 1851 as it did during the preceding 10 years, the subjoined Table would exhibit the rate of mortality from pulmonary diseases, in either sex, during the five years 1855-59 in the registration district, in the borough of Preston, and in the out-lying sub-districts, Longton, Walton-le-Dale, Alston, and Broughton, thrown together so as to form a single district contrasted with that of the Northern standard district.

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—  
Cotton district.  
—  
Preston.

AVERAGE ANNUAL NUMBER of DEATHS from PULMONARY AFFECTIONS  
to each 1,000 Persons of either Sex during the Five Years 1855-59.

Name of District.	Male.	Female.
Preston Borough - - - - -	9·75	9·28
The Sub-districts of Longton, Walton-le-Dale, Alston, and Broughton - - - -	3·58	3·76
Preston Registration District - - - -	8·12	8·01
Six Northern Standard Districts - - - -	2·97	3·04



## Appendix.

## VI. Excessive mortality from lung-diseases.

## Cotton district.

## Preston.

If the population have increased either more or less rapidly since 1851 than is here assumed, the figures on the Table would nevertheless be erroneous only to a very small and unimportant extent.

Thus, while the inhabitants of the borough of Preston of either sex die at three times the normal rate, the rate of mortality in the outlying districts is not much larger than that which prevails in the healthy Northern standard district. It is, therefore, quite certain that the bleak climate of Preston is not the principal cause of the high rate of mortality from pulmonary diseases among the inhabitants. Doubtless many causes co-operate to produce this result; in the male sex especially many occupational influences are in operation which tend to produce pulmonary disease. Among females it is very probable that factory labour, and the exposure to considerable alternations of temperature consequent upon the heated state of the work-rooms, may be partly the cause of the great prevalence of these diseases in Preston.

The information collected in the flax mills of Preston has been already made use of in the report on that branch of manufacture under the head of Pateley Bridge. The worsted manufactories of Preston differ in no material degree from those seen in the worsted and woollen districts.

The cotton mills of Preston are, for the most part, capacious, the rooms being lofty, and affording ample space per head in proportion to the number of operatives. The ventilation is also better provided for than in the factories of several other manufacturing towns comprised in this inquiry; but these means are very often rendered practically inoperative by the repugnance of the operatives to the free admission of fresh air. Hence the atmosphere of the factory rooms is frequently stagnant and oppressive. The temperature of the work-rooms in cotton factories is generally much elevated, and was found to range from 65° to 80° at the time of visit, from 70° to 75° being the temperature most frequently noted. These rooms in winter are heated by means of pipes containing hot water or steam.

Various measures, such as covering the carding engines, and the employment of flues and "fans," to prevent the dispersion of dust and cotton flue in the atmosphere of the workrooms, are now commonly adopted in cotton mills. There is, therefore, now much less danger than there formerly was of inhaling fine cotton fibre or dust; and this cause of bronchial irritation is probably reduced almost to a minimum degree. But though this evil is so greatly mitigated, it is not entirely removed; a certain quantity of dust and flue still escapes into the atmosphere, especially into that of the carding rooms, and the operatives suffer more or less from inhaling it. The overlooker in the carding room of one factory stated, that he occasionally suffered from discomfort and tightness in the chest, and from cough, in consequence of inhaling particles of cotton fibre, and that the operatives under his charge are very liable to catarrhs. The manager of another mill said, that the carding-room operatives are very apt to become asthmatical about middle life, and that few of them are long lived. Other persons connected with this department of the manu-



facture gave similar evidence. Mr. Goodair, a manufacturer, reported, that the quantity of dust and flue dispersed in the air depends very much upon the quality of the cotton in process of manufacture, of which there are several varieties, classified according to their value, or the place from whence they are imported, such as Sea-island cotton, Egyptian, Brazilian, Orleans, Surat and Indian cotton. The difference, he added, does not depend entirely on the greater quantity of dust contained in the inferior sort of cotton, but is owing likewise to the greater rapidity with which this commoner sort is passed through the carding engine. The same gentleman also said, that few men who work regularly in the carding rooms arrive at the age of 50 without becoming affected with difficulty of breathing, cough and expectoration. These, however, often survive for many years, after being compelled to abandon their occupation, a statement borne out by the death registers, which show the deaths of many persons of this class from pulmonary disease who had attained to a good old age. All the operatives in the carding room are liable to suffer from inhaling the mechanical impurities contained in the atmosphere; but those who strip the cards and the card-grinders being, from the nature of their work, brought close to the carding engines, are the class most exposed to this danger. Some of the operatives cover the mouth and nostrils, in order to exclude dust while stripping the cards. Grinding the carding engines, which is done daily, is far the most injurious process in the manufacture of cotton, the grinders being exposed to an influence very similar to that to which the dry-grinders of cutlery are subject. Indeed so injurious is the process deemed, that in some factories the carding engines are removed from the room in order to be ground, while in others a machine is used for grinding, which supersedes manual labour, and preserves the grinder from inhaling the dust evolved in the process. Some of the carding engines are now also constructed on a principle which does away with the necessity of their being stripped. The grinders have a sickly aspect, and are undoubtedly the most unhealthy class of cotton operatives.

Mr. Howitt, one of the certifying surgeons, bore testimony to the injurious effect produced on the health of the operatives by inhaling particles of cotton fibre and dust dispersed in the atmosphere of the carding rooms, and added, that he had repeatedly, and with the happiest result, advised young women who worked in these rooms, when suffering from bronchial irritation or hæmoptysis, to discontinue this branch of labour, and become weavers.

Operatives employed in the winding and warping and the spinning departments of cotton factories are not necessarily exposed to any specially noxious influences, excepting perhaps the heat of the spinning rooms, and the danger consequent upon exposure to vicissitudes of temperature in going and returning to and from the mills; but in some factories they are also exposed to the influences arising from inefficient ventilation, and from working for 10 hours a day in a close atmosphere. The weaving-sheds of Preston are, in general well constructed. Hand-loom weaving is not entirely disused, and both male and female weavers were seen at work who sat erect without leaning against the breast-beam even when, as in one

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instance, the free use of the feet was required for moving eight treadles. Weavers in cotton factories are, upon the whole, in appearance a healthy class of operatives, and usually present a favourable contrast to the workers in other departments of the same mill.

The men employed in sizing or dressing yarn to prepare it for weaving deserve notice, because, though exposed to conditions apparently dangerous to health, they are yet, for the most part, stout in appearance, and are said to be healthy; the temperature of their work-places is high, often not much under 100°, and, being freely ventilated, the men are greatly exposed to draughts of air. The process of sizing consists in stiffening the yarn by means of a compound, consisting chiefly of a solution of some farinaceous substance, such as flour or starch. The threads, after being sized, are either passed over cylinders full of hot steam, or through a current of highly heated air, in order that they may be rapidly dried; hence proceeds the great heat of the workshop, which is, however, accompanied by this advantage, that the air holds aqueous vapour in solution in proportion to the elevation of the temperature.

10. TOWCESTER and NEWPORT PAGNELL.—*Lace-making.*Lace-making  
districts.Towcester.  
Newport Pagnell.

THESE are both lace-making districts, so similar in many respects, that they may be properly considered together. Fully half the male inhabitants of both districts are engaged in the cultivation of the soil: a few are employed in the manufacture of shoes, a calling which is on the increase, especially in Towcester, where it has only recently been introduced. A considerable section of the women above 20 years of age, and a large, but uncertain proportion of the girls and young women below that age, are employed in the manufacture of lace. Many of the young women have also recently commenced shoe-making. Each of these districts contains a small market-town; those of Towcester and Newport Pagnell, from which the registration districts takes their names, and the latter also includes Olney, which, though not considered as a town by the Census Commissioners, contained in 1851 a population of more than 2,000 persons. Neither of the above towns is densely built, and Olney consists almost entirely of a single long broad street.

The soil of Towcester consists chiefly of clay. The town is damp, has many stagnant ditches in its vicinity, and the lower part is liable to floods. Fogs are common, especially at Abthorp, a damp village, where the population is said by the medical men to be unhealthy, and particularly prone to pulmonary diseases. Rheumatism is prevalent throughout the district, and goitre is common in particular places.

Excepting about the Brick Hills, at the extremity of the district, Newport Pagnell is for the most part low, flat and damp. Rheumatism and cardiac affections are said by the medical men to be very prevalent. Goitre is common in some of the parishes; ague is now rare, but sciatica and other neuralgic affections are of very frequent occurrence.

The mortality produced by pulmonary diseases of all kinds in these districts during the septennial period 1848-54 was at the



average annual rate of 4·75 per 1,000 males, and of 5·73 per 1,000 females, in Towcester, and of 4·30 per 1,000 males, and of 5·45 per 1,000 females, in Newport Pagnell. Thus, the mortality of females in both districts was at the rate of one per 1,000 higher than that of the males, and rather more than one higher than the rate which prevailed during the nine years 1847-55 in a large, healthy rural district of Surrey and Sussex, already quoted in the report on Saffron Walden, as affording a suitable standard of comparison. The mortality of males in both Towcester and Newport Pagnell but slightly exceeds the rate in this standard district. The population of both Towcester and Newport Pagnell was almost stationary during the 10 years anterior to the census of 1851, that of Towcester having increased only from 12,537 to 12,806, and that of Newport Pagnell from 22,997 to 23,109 during the 10 years. Judging from the annual number of births and deaths, the rate of increase since 1851 has been small, and both populations are thought by the inhabitants to be about stationary. If the populations of these districts have not increased at a greater rate since the last census than during the 10 years preceding it, the mortality from pulmonary diseases during the last five years, has been rather larger among the males in proportion to their number, in comparison with that of the preceding seven years. But as the precise numbers of the population must be regarded as rather uncertain, it may at least be inferred that the mortality has not decreased since the time of the earlier calculation. The average annual rate of mortality from pulmonary diseases, on the above supposition, would be—Towcester, males 5·20, females 5·71 per 1,000; Newport Pagnell, males 5·30, females 5·50 per 1,000. A much larger proportion of the deaths of males than of females have been those of young children; so that, if it were possible to compute accurately the rate of death for the several ages, the pulmonary mortality of girls and women would be found much more largely to exceed that of boys and men than does the rate among females of all ages exceed that among males of all ages.

Rather less than one-third of the deaths of males, and nearly one-half of those of females, from pulmonary affections, in Towcester, during the five years 1855-59, are entered in the death-register under phthisis, or one of its synonyms. Nearly half of the deaths of males, and rather more than half those of females, from pulmonary diseases, in Newport Pagnell during the same term of years are registered under the name of phthisis, or some synonymous term.

The most important facts in connexion with the pulmonary mortality of these districts are the slight increase in the mortality of males during the last five years, and the excess in the mortality of females over that of males, and also over the normal rate during both the earlier and later periods. The number of men and boys employed in the sedentary occupation of shoemaking is said to have considerably increased in Towcester during the last 10 years. Perhaps this circumstance may have affected the rate of mortality. It was also alleged both by the medical men and by some of the inhabitants, that pulmonary diseases, particularly consumption, are more prevalent, and occasion a greater number of deaths, in proportion to the population, in the village of Abthorpe, where the occupation of

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shoemaking is very common, than in the remainder of the district. Mr. Rogers, a medical officer of the Newport Pagnell Union, stated, that bronchial affections, and therefore it may be presumed the mortality from pulmonary diseases, had, he believed, increased among agricultural labourers since the introduction of steam-threshing machines. This statement, made before the rate of mortality was calculated, tallies with the fact, that the mortality from pulmonary diseases has really increased among the male population; but it would be impossible to determine whether the increased mortality is referable to this cause without computing the rate of mortality for each period of life, which at present could not be done with accuracy. The same medical man, who has been in practice at Newport Pagnell for 34 years, stated, that pulmonary diseases, especially phthisis, are now less prevalent than they formerly were; and he attributed the improvement partly to the diminution of lace-making, especially by the men and boys, who formerly worked at this occupation, partly to the improved feeding and clothing of the labouring population.

The death-registers afford no evidence that the mortality from pulmonary affections among females is unequally distributed among the different sections of the population, as regards their occupation. So few of the deaths are registered as those of lacemakers, that there can be no doubt the deaths of very many females who followed that calling have been recorded under the occupation of their fathers or husbands. A very large proportion of the women and girls both of Towcester and Newport Pagnell are employed in lace-making, which is in both places a domestic occupation; and it is in some circumstances connected either with their mode of life or their calling that we must look for the cause of their high rate of mortality from pulmonary diseases.

The dwellings of the labouring classes both in Towcester and Newport Pagnell are often very small, overcrowded, and ill-ventilated: cottages are frequently found in which the largest room does not exceed 11, 12, or 13 feet square, by from  $6\frac{1}{4}$  to at the utmost 7 feet high; many of them being without backdoors or windows, do not possess the means of thorough ventilation. The bedrooms are often entered one through the other, and in many instances there is no chimney in either of the sleeping apartments. These faults of construction in the dwellings of the labouring classes may be said to be the rule rather than the exception; and as, under such circumstances, the breathing space is smaller than is required for healthy respiration, it is not surprising that females, who are occupied at home, should suffer more than the males, who are chiefly employed abroad. Even in many of the cottages of larger dimensions the internal atmosphere is stagnant at night, owing to the absence of chimneys, or to the fact of their being closed up to exclude draughts of air. Such rooms always have a close, stifling smell to strangers coming from the open air, even though they be sufficiently capacious.

Among the deleterious influences to which the females of Towcester and Newport Pagnell are exposed in consequence of their occupation, are its sedentary nature, the early age at which children are put to it, and their posture while at work. The women employed



in the manufacture of lace work for 9, 10, or 12 hours per day, and occasionally even longer. The work is done in the cottages during the greater portion of the year; but in fine summer weather the women and children may be seen out of doors, working under the shelter of a hedge, or in some other place out of the reach of dust, against which they are compelled, from the nature of their work, to take every precaution.

Lace is made upon circular pillars or cushions, stuffed with straw, which rest at one side upon a sort of wooden frame, and at the other upon the knees of the worker, who is thus compelled to maintain a more or less constrained position. Sometimes the wooden frame, or "maid," as it is locally called, is furnished with a semicircular hoop of wood, which rests against the knees, and entirely supports the cushion, thus in a great measure relieving the worker from her irksome position. The cushions are usually placed so low, that the worker is compelled to stoop over her work, and, the arms being habitually brought forward, in order to enable the women to handle the bobbins, lacemakers are apt to become round-shouldered, and, their chests being contracted, the act of respiration, particularly when the cushion rests on the knee, is not freely and efficiently performed. Many of the women have a pallid anæmic aspect, and are subject to disturbance of the menstrual functions, and to leucorrhæa. The younger women are often chlorotic, and are very subject to catarrh, being rendered peculiarly susceptible to atmospheric vicissitudes by their sedentary mode of life, and the circumstance of their working in close, ill-ventilated apartments. Slight spinal curvature is common, and the chest is almost always flat and ill-developed. Indeed the entire labouring population of these districts, men as well as women, have a stunted, ill-nourished appearance.

The long hours and close labour required to earn a maintenance at lacemaking and the early age at which girls are put to the work, are said by the medical men of both Towcester and Newport Pagnell to exercise a baneful influence upon the mothers, who are rarely either good nurses or good housewives. The women are said to neglect their children, to feed them on improper diet, and to drug them with Godfrey's cordial. The mortality among young children is said to be very high, a statement which is true as regards Towcester for the septennial period 1848-54, during which the mortality among children under the age of five years was at nearly double the normal rate. During the winter, when the women work entirely within doors, every crevice or chink through which a draught of air could find entrance is carefully stopped. The women are said very rarely to leave the immediate vicinity of their dwellings, and to take but little exercise in the open air, and that for the most part late in the evening, regardless of weather, and often when imperfectly clad. The inmates of neighbouring cottages sometimes assemble in the same room to work in company, particularly at night, when artificial light is required, a single candle thus serving for several workers, each of whom has a globe filled with water, supported on a wooden stand, placed between the candle and her work, upon which it concentrates the light. Ophthalmia is not unfrequent; but on inquiry, it did not appear to be more prevalent among the females, who

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work during several hours in the long winter evenings by artificial light, than among the rest of the community. Their sedentary mode of life renders the women liable to suffer from cold feet in the winter season, to obviate which annoyance, many of them are accustomed to place a sort of chafing-dish, filled with embers from the fire, or, it was said, with ignited charcoal, beneath their dress, a practice which, of course, tends to vitiate the atmosphere of their small ill-ventilated cottages.

Children are, if possible, even more exposed than adults to some of the pernicious influences attendant upon the occupation of lace-making. Girls begin the work as early as, and sometimes earlier than, seven years of age. Partly for the purpose of learning the business, but chiefly in order to be under the superintendence of a mistress, they are usually sent to a lace school, where they are expected to make a given amount of lace in the course of the day. The hours of attendance in these schools vary somewhat, according to the age of the children, and the custom of the place. In one of these schools, at Towcester, the hours of attendance were from 7 to 12 a. m., and from 1 to 4 or 6 p. m., the younger children ceasing work at 4, the elder remaining until 6 o'clock in the evening; the period of labour thus varying, according to the age of the child, from eight to ten hours per day. In another school at Towcester the length of attendance was said to vary from seven to nine hours, according to the age of the children; but from eight to ten hours per day appears to be the more usual duration of labour in these schools both in Towcester and Newport Pagnell. As in the platting schools, so here likewise, the children must complete their appointed task before leaving, and, failing to do this, are detained until it is finished. The schools are held in ordinary cottages, and are often much overcrowded. The following are the sizes of the rooms and the number of the pupils in several lace schools.\*

Place.	Size of Room.	Number of Pupils at time of Visit.	Cubical Space per Head.
	<i>Cubic feet.</i>		<i>Cubic feet.</i>
Towcester - - -	1,666	9	185
Ditto - - -	1,980	17	116
Ditto - - -	1,470	8	183
Greens Norton - -	1,274	12	106
Silverstone - - -	520	9	57
Ditto - - -	1,092	11	99
Newport Pagnell -	1,260	9	140
Ditto - - -	1,200	18	66
Ditto - - -	882	12	73
Ditto - - -	1,512	20	75
Olney† - - -	1,404	40	35

\* At the time of this inquiry the lace trade was in a very depressed condition, and the attendance at the schools small; many of them are said to be attended by twice as many children in better times.

† This room was visited on a Saturday, when the children were absent; the number is therefore stated on the report of the mistress.



From the position which they occupy while at work the children employed in this trade very soon become round shouldered and narrow chested. The following are the anterior and posterior measurements of the breadth of the chest, in some of the children, made at the residence of Mr. Watkins, who was good enough to collect them from the neighbouring cottages for this purpose. Both measurements were taken from the bi-cipital groove on one side to the corresponding groove on the opposite side, and care was taken to allow the children to stand in their ordinary manner, without suggestion or constraint :

Age of Child.		Anterior Measurement.		Posterior Measurement.
9 years	-	11 inches	-	14 inches.
11 "	-	12 "	-	14 "
15 "	-	13 $\frac{1}{2}$ "	-	16 "
17 "	-	14 "	-	17 "
11 "	-	12 "	-	15 "
8 "	-	10 $\frac{1}{2}$ "	-	13 $\frac{1}{2}$ "
9 "	-	12 "	-	14 "
18 "	-	14 $\frac{1}{2}$ "	-	16 "
12 "	-	12 "	-	14 $\frac{1}{2}$ "
15 "	-	14 "	-	16 "
12 "	-	13 "	-	17 "

In several instances the difference of the anterior and posterior measurements was much lessened when the girls were desired to hold themselves up, or were placed in position; but this was evidently attended with much constraint, discomfort, and fatigue. The muscles of the back and shoulders are generally flabby and badly developed in these children; and the above measurements may be relied upon as correct when the subjects of them were in their ordinary posture. An opportunity offered at Preston for taking similar measurements of some factory children, aged from 8 to 12 years, who presented themselves for examination by one of the certifying surgeons under the Factory Act. The posterior measurement exceeded the anterior in all the lace-makers. Among an equal number of factory children the anterior and posterior measurements were equal in four; the posterior exceeded the anterior by a quarter of an inch in one, by half an inch in three, by 1 inch in one, by 1 $\frac{1}{2}$  inch in two. The numbers examined in both cases were small; but, as the children were taken without selection as they happened to be met with, the comparison appears to bear adversely on the lace-makers.

Among the causes assigned by the medical practitioners of Towcester and Newport Pagnell for the prevalence of pulmonary diseases, especially of phthisis, is the frequent intermarriage of blood relatives, a custom of common occurrence in some of the rural districts. A somewhat remarkable fact, which may perhaps be regarded as partially confirming the above statement, is the much greater prevalence of black-haired persons in Towcester, and of light-haired persons in Newport Pagnell. Of course both were found in each place, but the preponderance of dark hair in Towcester, and of light hair in Newport Pagnell, was very striking.

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## Appendix.

11. BERKHAMPSTEAD.—*Straw Plat Manufacture.*

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BERKHAMPSTEAD may almost be considered as an entirely rural district. A large proportion of the men are employed in the cultivation of the soil; the women and girls are largely engaged in the manufacture of straw-plat, nearly one-third of the women over 20 years of age having been engaged in that occupation at the time the census of 1851 was taken. The registration district comprises the two sub-districts, Berkhamstead and Tring, each containing a small town, from which the sub-district derives its name. The town of Tring contained at the time of the last census rather more, that of Berkhamstead rather less than 3,000 inhabitants. Tring, which has the largest population, is also the most densely built; it contains a silk mill, giving employment to about 360 persons, including 52 pauper apprentices, and two canvas factories, which afford employment to about 50 or 60 men and boys. The town of Berkhamstead, with a smaller population, is also less densely built than Tring; the main street is long, broad and spacious, and the buildings are not continuous, but form irregular groups, with interspaces admitting a free passage of air; there are, properly speaking, no manufactories, but a few of the men are employed in making wooden implements. The greater part of the population of the sub-district is located in a narrow valley; and, though the hills on either side are of no great elevation, the valley is close, rather damp, and subject to fogs, which often envelop the town of Berkhamstead and the lower ground, when the adjoining uplands are perfectly free.

The mortality produced by pulmonary affections of all kinds in Berkhamstead was at the average annual rate of 4·91 per 1,000 of the male, and of 5·66 per 1,000 of the female population during the septennial period 1848-54; in consequence, no doubt, of migration into other districts, the population had increased less than the excess of births over deaths during the ten years previous to the census of 1851; and, judging from the annual number of births and deaths subsequent to that year, the rate of increase has not varied much since. Assuming that the population has continued to increase at its former rate, the mortality from pulmonary affections has been slightly lower in the male and higher in the female population during the five years 1855-59 than it was during the preceding seven years, the mortality of the male population having been at the average annual rate of 4·80, that of the female at the rate of 6·02 per 1,000 persons of either sex. The deaths have not been equally distributed over the district, the rate of mortality in both sexes having been higher in the sub-district of Berkhamstead than in that of Tring; the proportions being, Berkhamstead, male 5·12, female 6·44; Tring, male 4·56, female 5·71 per 1,000 persons of either sex. Thus, that portion of the district which is the least urban, and contains the smallest manufacturing element, shows the largest mortality in proportion to the number of its inhabitants. The average annual mortality from pulmonary diseases during the nine years 1847-55, in a large group of districts in Surrey and Sussex, comprising the towns of Dorking, Petworth, Reigate, and Midhurst, and containing at the last census a population of 71,330 persons, was 4·11 per 1,000



males, and 4·54 per 1,000 females. The rate of death from pulmonary affections in Berkhamstead and its sub-districts is contrasted with this standard in the annexed Table:—

AVERAGE ANNUAL NUMBER OF DEATHS FROM PULMONARY AFFECTIONS in the *Berkhamstead* Registration District, in the Sub-districts of *Berkhamstead* and *Tring*, and in the Six Standard Districts of *Surrey* and *Sussex*, to each 1,000 Persons of either Sex.

Name of District.	Per 1,000 Males.	Per 1,000 Females.
Berkhamstead, Registration District - -	4·80	6·02
<i>Berkhamstead</i> , Sub-district - - - -	5·12	6·44
<i>Tring</i> , Sub-district - - - - -	4·56	5·71
SIX STANDARD DISTRICTS IN SURREY AND SUSSEX - - - - -	4·11	4·54

If unimportant fractional differences be disregarded, the mortality of the male population of Tring does not differ materially from that of the healthy standard district; that of the female exceeds the standard by one annual death in each 1,000 of the female population. On the other hand, the mortality of both sexes in the sub-district of Berkhamstead considerably exceeds the standard. It is very remarkable that the excess of the pulmonary mortality of Berkhamstead over that of Tring is almost equal in the two sexes, from which fact it may perhaps be not improperly inferred that, whilst there is some cause in operation which aggravates the female mortality from pulmonary diseases throughout the entire registration district, there is also some cause at work which affects equally the male and female population of the sub-district of Berkhamstead. The deaths in the union workhouse are registered in the sub-district of Berkhamstead, the mortality of which may, perhaps, be thereby slightly raised, but not sufficiently to account for the high rate of mortality from pulmonary diseases. Rather more than half the deaths of both sexes from pulmonary disease are entered in the death register under the head of phthisis, and a still larger proportion of the deaths between the ages of 15 and 50 years are attributed to this cause.

The most prominent facts regarding the pulmonary mortality of Berkhamstead are the excess of the mortality of females over that of males throughout the entire district, and the excess of the mortality of both sexes in the Berkhamstead over that in the Tring sub-district. It being impossible to estimate accurately the distribution of the population with regard to age, it is difficult to ascertain, in a trustworthy manner, the pressure of the pulmonary mortality upon the adult population; but, so far as can be gathered from the ages of the dead, it appears that the sub-district of Berkhamstead loses a larger proportion of persons from pulmonary disease, particularly from phthisis, between the ages of 30 and 50 years, than that of Tring. The death register does not indicate any relation between the occupations of the people and their liability to die from pulmonary

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disease. The number of operatives employed in the silk-mill at Tring is too small to admit of any reliable inference of the effect of their occupation upon health from the number of deaths; and the deaths of persons employed in the manufacture of straw-plat, the staple occupation of the females of the district, recorded under the name of their calling, are so few, that it is quite certain the great majority of the deaths of females are entered in the death register under the occupation of their fathers or husbands, as the case may be. Almost all the women and girls are employed at making straw-plat, and there seems to be little doubt that the excess of the female mortality is connected with this circumstance; nevertheless, there is no reason why this manufacture should prove injurious to health; excepting, perhaps, the bleaching of straw with sulphur, an operation performed only by the straw factors, who form but a small section of the community, no part of the manufacture is attended by the evolution of fumes or dust, or by any other process dangerous to health. The fact that the rate of mortality is lower in Tring than in Berkhamstead, and more especially the much lower rate of mortality from pulmonary diseases in the neighbouring districts of Hemel Hempstead and Leighton Buzzard, where straw-platting likewise forms the chief female employment, seem to show that the influence which operates injuriously upon the health of the females of Berkhamstead is a contingent, and not a necessary condition, of the manufacture of straw-plat.

The manufacture is carried on at home, and the evils with which it is associated in Berkhamstead are the inferior character of the dwellings, the tender age at which girls are put to the occupation, its sedentary nature, and the long hours which must be devoted to it in order that it may be remunerative. The cottages of the labouring classes in Berkhamstead are usually small, ill-ventilated, and very frequently dirty; this applies more particularly to the modern houses, which are worse constructed and worse ventilated than the older ones. A few examples out of many noted will serve to illustrate the prevailing character of the dwellings.

A cottage inhabited by a family of six persons, four of whom were straw-platters, consists of four rooms, two on the ground, and two on the first floor. The largest room on the ground-floor is ten feet square by  $6\frac{1}{2}$  feet in height; and the two bed-rooms, which are six inches higher, have no fire-place, and are entered one through the other. This is the average size of a great many of the modern cottages, the bedrooms of which must at all seasons resemble closed boxes during the night, when alone they are occupied. In another cottage of a superior kind, occupied by a family of eight persons, and which likewise consisted of four rooms, the largest apartment is 12 feet by 13, and seven in height. The scullery behind it is not more than half the size; and over these two rooms are the two sleeping apartments, which are entered the one through the other, and have but a single chimney. The cubical space per head during the night does not exceed 200 cubic feet. The largest rooms in other cottages were 11 feet by 10 feet, and 7 feet in height; 11 feet by 12 feet, and 7 feet in height; 11 feet by 11 feet, and  $7\frac{1}{2}$  feet in height; 12 feet by 12 feet, and 7 feet in height; and 13 feet by 12 feet, and  $6\frac{1}{2}$  feet



in height. One cottage was noted as unusually spacious, in which the largest room is 14 feet by 12 feet, and 8 feet high.

The cottages of Tring are, upon the whole, larger and better than those of Berkhamstead. There is one row consisting of about 20 recently-built cottages, in each of which the down-stairs apartment is 20 feet by 14 feet, and 7 feet in height. The upper floor, which is of the same area, but 8 feet high, is divided into two sleeping apartments, the one within the other, the innermost being provided with a fire-place. Even these larger dwellings are sometimes too small for the number of their inmates. One of them at the time of inspection was occupied by a family of 11 persons, six of whom slept in one, and five in the other bedroom; without making any allowance for furniture, and the bodies of the inmates, which of course diminish the breathing-space, the cubical space per head during the night did not exceed 200 cubic feet. The intolerableness of such limited space to persons who have been accustomed to larger apartments, was well illustrated by a cottage at Tring, which had been inhabited by a workman from the north of England. He had placed a ventilating grate in both the front and back walls of his house, close to the ceiling of the bed-rooms, and had broken a hole in the wall between the two rooms, so as to allow the passage of a constant current of air through them by night as well as by day.

In summer the straw-platters usually sit with their doors open, and sometimes they walk about in fine weather, following their occupation as they walk; but in winter, or in rough weather, when compelled to close their doors, the breathing capacity of the rooms in which they work is often as limited as that of the bed-rooms at night. Children begin to learn the manufacture of straw-plat very early, often at four years of age. In the first instance they are generally taught by their mothers; but at about five years of age, and sometimes even sooner, they are sent to the platting-schools, where each child has an allotted task to perform during the day. The work at these schools is done on behalf of the mothers, who provide the straw, and fix the amount of plat which their children are expected to make during the day, paying the school-mistress a certain sum per week for her superintendence. The hours of attendance at these schools are long, and the schools are held in rooms almost invariably overcrowded, the atmosphere of which must in winter be much impaired by the respiration of so many persons. Many of the schools were visited, and the following facts illustrate their average character.

In the small back kitchen of a cottage near the canal at Berkhamstead 10 children and young women were making straw plat, under the superintendence of a dame. The hours of attendance were stated to be from 9 till 12 a. m., from 1 to 4 p. m., and from 5 to 8 p. m. daily; but as each of the children is obliged to finish her daily task, some of them are occasionally detained even longer. If, on the other hand, any of the children complete their task-work within the appointed time, they are allowed to return home. The youngest child in the school was four years of age; three children were ten years of age, and, with the exception of the young women, the others were of intermediate ages. The room occupied as a platting-school in another cottage was 13 feet by 12 feet, and 6½ feet

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in height. Its atmospherical capacity, therefore, when the door was closed, but little exceeded 1,000 cubic feet. There were only 11 children in attendance at the time of visit, making, with the superintendent, 12 persons in all; but the price of plat was so low at the time, that the schools were thinly attended; and this one was said to have an average attendance of 20 children in good times. Five of the 11 children were almost infants, and had not yet begun regular work; the rest were of an age varying from 6 to 12 years. The hours of attendance differed slightly from those already mentioned; but the average time of attendance was  $8\frac{1}{2}$  hours per day, liable, as usual, to be prolonged in the case of such children as had not completed their allotted task. At another school, in an outlying hamlet near Berkhamstead Common, 16 girls on the average are daily employed in making straw plat. The hours were somewhat shorter than in the schools already mentioned. Two of the girls were only five years of age, five or six were under eight, and the remainder from eight to fourteen years of age. At Aldbury a platting school is held in a room 20 feet square by  $7\frac{1}{2}$  feet in height. The daily attendance of children varies from 40 to 50, and the hours are from 8 to 12 a. m., from 1 to 4 p. m., and from 5 to  $7\frac{1}{2}$  p. m., the whole of the time being devoted to the manufacture of plat, excepting a few minutes thrice a day given to reading. Another room in the neighbourhood of Aldbury, also employed as a platting school, is 12 feet square by 6 feet in height, and has an average attendance of 27 children. The dimensions of a room used as a platting school at Pitstone, another hamlet, are 20 feet by 19 feet, and 7 feet in height. The attendance at the school, which consists of between 40 and 50 children, is 9 hours per day. The practice of sending children to these schools is said to be general throughout the straw-platting districts. In a few places the private schools have been interfered with by the introduction of the manufacture of plat during a portion of the day into the national schools. This is the case at Ivinghoe, in the district of Leighton Buzzard, where, notwithstanding, there is a private platting-school, which has sometimes numbered 100, and has, it was said, a regular attendance of from 70 to 80 children. The room in which the school is held was clean, dry and well ventilated; but its dimensions are only 20 feet by 17 feet, and 7 feet in height. When the school has been at the largest, a second room communicating with the other has also been made use of by a portion of the children.

Excepting in the case of mothers who have their children to attend to, the hours on the average devoted to the manufacture of straw-plat by adult women are very long. Young, and even married women, when they are able to do so, work from 10 to 14, and sometimes even to 15 hours a day, the average certainly being 12 hours. Excepting in fine weather, when the doors of the cottages are kept open, and the women sometimes sit in the open air, or walk about at work, these long hours are devoted to a sedentary occupation in badly ventilated cottages of very limited dimensions.

It may, perhaps, not unjustly be inferred, from the larger proportion of deaths in Berkhamstead between the ages of 30 and 50 years, that the excessive mortality in that sub-district is caused by some



influence in permanent, though it may be imperceptible, operation. The only conditions to which the inhabitants of Berkhamstead are exposed in which those of Tring do not participate are, that the former are, for the most part, resident in a narrow valley, more liable to fogs than the surrounding country, and that the dwellings of the labouring population are, upon the whole, smaller and of worse character than those of Tring. That the latter cause may be at least partly influential in causing the excessive prevalence of pulmonary diseases in Berkhamstead derives confirmation from the fact, that the rate of mortality from this class of diseases in the neighbouring district of Hemel Hempstead is lower in proportion to its population than in Berkhamstead, and that Mr. Whateley, one of the medical officers of the Berkhamstead Union, and surgeon to the West Herts Infirmary, likewise said that pulmonary diseases are less prevalent in Hemel Hempstead, a circumstance which he attributed to the larger size of the houses, and especially to the bedrooms being loftier and better ventilated.

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Straw-platting district.

Berkhamstead.

12. YEOVIL.—*Glove Making.*

THE registration district of Yeovil comprises numerous parishes and villages, and the towns of Yeovil and South Petherton, the former of which contained nearly 6,000, and the latter rather more than 2,000 inhabitants when the census of 1851 was taken. Ilchester, formerly the seat of the county assizes and gaol, and then a place of importance, contained at the same date a population of less than 1,000 persons, and was therefore not ranked as a town by the Census Commissioners. The district of Yeovil is mainly agricultural, more than one-third of the men having been employed in the cultivation of the soil in 1851; 8 per cent. were at the same date employed in the glove trade, and  $3\frac{1}{2}$  per cent. were sail-cloth manufacturers. Of the women, 29 per cent., or nearly one-third, were likewise engaged in the manufacture of gloves, which may be regarded as the staple business of the district.

Glove-making district.

Yeovil.

The male inhabitants of Yeovil died from pulmonary diseases at the average annual rate of 5·28, and the female of 5·91 per 1,000 persons of either sex during the septennial period 1848-54. These rates are considerably higher than those of the healthy standard group of districts in the same neighbourhood, which were 4·46 per 1,000 males, and 3·96 per 1,000 females, during the nine years 1847-55.\* The population of Yeovil underwent little change during the ten years immediately previous to the last census, having only increased from 27,844 to 28,463, being a little over the rate of 2 per cent. The average annual number of births and marriages during the four years 1855-58, rather fell short of the number during the five years 1850-54; the average annual number of deaths was almost identical in the two periods. No serious fallacy can, therefore, arise, if it be assumed that the population at the present time remains about the same as it was in 1851. On this assumption, the mortality from pulmonary

\* For an account of the standard ratio, see foot note on page 103.



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VI. Excessive  
mortality from  
lung-diseases.

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diseases during the five years 1855-59 has been at the average annual rate of 5.64 per 1,000 males, and of 5.53 per 1,000 females, rates which differ so little from those of the preceding seven years, that they may be regarded as having been almost identical in the two periods. Taking into consideration the rural character of the district, and especially that the urban portion is not densely built upon the surface of the ground, it appears certain that there must be some cause in operation which tends to increase the prevalence of pulmonary diseases beyond the normal rate. The excess is largest among females, but it also amounts to 1 in each 1,000 of the male population.

The deaths have been the most numerous in children under the age of five, and in persons over the age of 50 years, being nearly equal at the two extremes of life in both sexes. As nearly as it is possible to estimate the rate of mortality among persons over 20 years of age, that of females exceeds the normal rate about as much as does the rate among females of all ages; but the excess is decidedly less in males above the age of 20 years, than in males of all ages. This would seem to show that the female population is exposed to some deleterious influence, which renders its members rather more liable to diseases of the chest than males. An examination of the death registers does not indicate that the mortality falls with peculiar pressure upon any particular section of the population. In fact, some of the medical men asserted that the wealthier sort suffer as much as the industrial class from pulmonary diseases, and attributed the prevalence of these diseases to the humid climate, oppressive atmosphere, and wet soil of the district. Whether this opinion be correct or not, it is evident that the occupation of females is not always entered in the death register; seeing that, though a large proportion of the girls and women are engaged in the manufacture of gloves, only 32 out of 269 deaths of females above 15 years of age from pulmonary disease, which have occurred during the last five years, are recorded as those of persons engaged in some branch of this manufacture. It is clearly impossible to draw any trustworthy conclusion with regard to the influence of the prevailing occupation, on the health of the female population, from such imperfect data. Among the causes assigned by the local medical practitioners for the prevalence of pulmonary diseases, were the frequency of the strumous constitution, and the poor diet of the industrial classes, who are said very rarely to taste animal food.

The dwellings of the industrial population of Yeovil are often badly constructed, and ill adapted for health. The rooms are frequently small, low, and deficient in ventilation; the cottages often having neither back doors nor back windows. The manufacture of gloves is chiefly carried on in the dwellings of the industrial classes. There are indeed manufactories in Yeovil where the materials are cut out and partly made up, but the number of persons employed in these is small, compared with the number of those to whom the gloves are given out for the purpose of being made up at home. It is stated that there are altogether about 50,000 persons employed in this domestic manufacture in Yeovil and the surrounding districts, and some notion may be obtained of the different proportion in which the population is employed in this manufacture at home and in the shops from



the fact that, whilst from 80 to 100 operatives are employed at one of the principal factories of Yeovil, from 3,000 to 4,000 women, who work at home, are employed by the same manufacturer. While the women thus work chiefly at home, the men engaged in the glove trade for the most part work at the factories, where a few children and young women likewise find occupation. Boys sometimes commence working in the factories as early as seven years of age. The hours of attendance at the factories are from 6 a.m. to 8 p.m., which, allowing a reasonable time for meals, leaves fully twelve hours of labour. The work-rooms in some of the factories are low, and the ventilation very imperfect.

Except from working in ill-ventilated rooms for so many hours a day, there is no ostensible reason why persons employed in the glove factories should suffer in an unusual degree from pulmonary diseases. Drinking is said to be a common vice among the men, many of whom pass the first two days of the week in dissipation, and work very hard during the remainder, to recover lost time. On this account men sometimes work as long as 17 or 18 hours out of the 24 towards the end of the week. It was asserted that, though still dissipated and improvident, the character of the men has much improved during the last 20 years.

The domestic branch of the glove manufacture is almost exclusively carried on by women and girls, who work in the small ill-ventilated rooms of their cottages, and sit very close at their employment during many hours of the day. It is said that sometimes, when work is very pressing, they devote as many as 16 hours a day to their labour; but it was established without doubt that they commonly work 12 or 13, and frequently 14 hours out of the 24. Indeed it was plainly stated by some of the more intelligent women, that female glovers who have to earn their own maintenance, must work very diligently and sit very closely to their labour. The occupation is entirely of a sedentary nature, and the women, sitting upon low seats, constantly stoop much over their work, which is fixed on an upright stand, called an "engine." This machine consists of a kind of brass forceps, which holds the glove tightly, and is grooved to correspond with the number of stitches intended to be inserted in the glove that is being made. The brass part of the engine is supported upon a stand, which is commonly too low, thus obliging the women to lean forward, and thereby more or less to compress the chest, and impede free respiration. The younger girls, being shorter, stoop less over their work than the women, which seems to show that at least one evil attendant upon the occupation might, be remedied by making the shaft of the engine a few inches higher, so as to correspond with the height of the person using it. Those women who stitch the welt, and do the ornamental pointing on the backs of gloves, do not stoop over their work in the same manner as do the sewers of gloves; but, apart from this, they are exposed to the other influences incidental to the trade. Women often continue the employment after marriage; but, having their household duties to attend to, married women usually work shorter hours than the unmarried. The women engaged in the manufacture of gloves at their own homes rarely go out of doors, but some of them carry their work

## Appendix.

VI. Excessive mortality from lung-diseases.

Glove-making district.

Yeovil.



## Appendix.

VI. Excessive  
mortality from  
lung-diseases.Glove-making  
district.

## Yeovil.

when finished to the factory at the end of the week, and procure an additional supply. More frequently women who reside at a distance from the factories obtain their work from a woman called a "carrier," or "bag woman," who receives it from the manufacturer, by whom she is held responsible for its restoration, and sub-lets it, so to speak, at a slightly reduced rate of remuneration, to the women who really do the work, from whom she collects it at the end of the week. Sometimes the younger women assemble in parties of eight or nine in a single cottage to work; but this is certainly not very usual, it being more common for a mother and her daughters to work together in their own cottage by themselves. Young girls begin the business of glove making sometimes as early as the age of seven, but commonly at that of eight or nine years. It is usual for mothers to set their children a certain amount of task-work, which must be completed before the close of the day. There are no schools where glove-making is taught, as is the case in the lace and straw-plat districts; but schools are kept by dames to which the younger children are sent, in order that their mothers may follow their occupation, and such schools are frequently over-crowded.

As far as could be ascertained, the great prevalence of pulmonary diseases among the population of Yeovil, as shown by the excess of mortality above the normal rate, is caused mainly by the sedentary habits of the people; by the small, imperfectly ventilated, and often over-crowded cottages in which they dwell; and, in the case of the men, and of a small proportion of females and children, by the close ill-ventilated factory rooms in which they work.

13. SAFFRON WALDEN.—*Agriculture.*Agricultural  
district.Saffron  
Walden.

THE registration district of Saffron Walden comprises the town of that name, containing about 6,000 inhabitants, and several rural parishes. It is almost exclusively an agricultural district, about 56 per cent. of the men having been engaged in the cultivation of the soil in 1851. The mortality from pulmonary diseases during the septennial period 1848-54 was at the average annual rate of 5.20 per 1,000 males, and of 6.12 per 1,000 females. The population of Saffron Walden increased very little, but, apparently, with great regularity, during the 20 years anterior to 1851, and, judging from the average annual number of births, marriages and deaths during the last ten years, seems to have changed but little since the above date. If the population be about the same now as it was in 1851, the mortality from pulmonary diseases during the five years 1855-59 has been at the average annual rate of 4.41 per 1,000 males, and of 5.67 per 1,000 females. If, on the other hand, it has increased at the same rate since 1851 as it did during the previous ten years, the rate would be less than the above by a very small fraction.

From calculations, made with a view of ascertaining the normal rate of mortality from the several diseases most unequally distributed among different districts, in proportion to their population, the mortality from pulmonary diseases in a healthy standard district in Surrey and Sussex was found to be at the average annual rate



of 4.11 per 1,000 males, and of 4.54 per 1,000 females.\* The mortality in Saffron Walden, during the earlier period under consideration exceeded this standard largely, during the later period slightly among the male, and very considerably during both periods among the female population. It is worthy of note that the lower rate of mortality in the later period is entirely attributable to a diminution of the number of deaths from phthisis, the rate of mortality from other diseases of the chest having been almost identical in the two periods. The subjoined Table shows the mortality from phthisis and diseases of the organs of respiration, separately for either sex, during the two periods in Saffron Walden, and also the rate for either sex in the above-named standard district.

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VI. Excessive mortality from lung-diseases.  
Agricultural district.  
Saffron Walden.

AVERAGE ANNUAL NUMBER of DEATHS from the several under-mentioned Causes to each 1,000 Inhabitants of either Sex.

Cause of Death.	Standard District in Surrey and Sussex during the Nine Years 1847-55.		Saffron Walden during the Seven Years 1848-54.		Saffron Walden during the Five Years 1855-59.	
	Male.	Female.	Male.	Female.	Male.	Female.
Phthisis - - - -	2.12	2.88	2.69	3.50	2.01	2.98
Diseases of the respiratory or- gans (a) - - - -	1.99	1.66	2.51	2.62	2.40	2.69
PULMONARY DISEASES (b) -	4.11	4.54	5.20	6.12	4.41	5.67

(a) This head comprises laryngitis, bronchitis, pleurisy, pneumonia, asthma and diseases of the lungs.  
(b) This group comprises phthisis and " diseases of the respiratory organs."

The number of deaths in each year is too small to admit of any trustworthy conclusions being deduced from the mortality of any single year; but it deserves at least to be mentioned, that the smallest mortality from phthisis during the 12 years, 1847-59, occurred in the last three years, 1857, 1858 and 1859. The deaths from this disease in 1853 were, indeed, rather fewer than in 1857, but the three most fatal years were those immediately preceding 1853, and the mortality again increased in 1854. Without, therefore, drawing any positive conclusion from these facts, they may at least be regarded as indicating a tendency to improvement, the certain existence of which can only be determined by future returns.

The population of Saffron Walden includes a very large proportion of labouring men whose earnings are small: the majority of the inhabitants are therefore but indifferently fed. The subsoil consists chiefly of heavy, cold, wet clay and chalk. Catarrhs are of common occurrence, and frequently prevail in an epidemic form. Both the medical men and the registrars of deaths said that pulmonary diseases

\* For an account of this standard district, see foot note page 103.



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prevail chiefly among the labouring part of the population, and the former added, that the people are not a robust race, but deficient in stamina, and easily broken down by illness. The females formerly worked at straw-platting; but this manufacture is now almost discontinued, and was only met with once or twice in the course of the inquiry.

The town of Saffron Walden is not densely built, and the outlying population, even when gathered into villages, as at Newport and Hempstead, is scattered in a straggling manner. The dwellings of the people require no lengthened description: they vary greatly in character, many being small and imperfectly ventilated, others larger, and of a better sort. On the whole, the cottages of the labouring class are rather better than in many other agricultural districts; but the bed-rooms, especially in the more modern sort of dwellings, are frequently over-crowded. The principal room of modern cottages, that in which the family meals are taken, rarely contains more than 1,000, often not more than 800, cubic feet. The cubic space for each inmate in the bed-rooms of several dwellings, taken indiscriminately, varied from 125 to 500 cubic feet. Of 12 of these cottages, in which the dimensions of the bed-rooms were taken, the breathing space per head was less than 200 cubic feet in three; from 200 to 250 cubic feet in four; from 250 to 350 cubic feet in two; and more than 350 cubic feet in three. Houses of the older sort are often more capacious, the room or kitchen which the family occupy during the day frequently having a wide fire-place and large chimney, very conducive to ventilation; and the bed-rooms, though directly under the roof, lighted by small dormer windows, badly ventilated and close, are usually of much greater capacity than those in more recently constructed cottages.

The death register throws no light on the causes of the excessive mortality from pulmonary diseases in Saffron Walden. The females are exposed to similar conditions throughout the district, the more important of these being the small capacity and imperfect ventilation of the houses. A much larger number of females than of males, under the age of 20 years, died of phthisis during the five years included in the inquiry. The deaths of females above the age of 20 years from phthisis were, to those of males, as 107 to 75. Women died at a rather earlier age than men from phthisis, at a somewhat later age from diseases of the respiratory organs. Exclusive of the deaths of persons under 20 years of age, the average age at death of the men who died of phthisis was 36·7; of the women, 34·8 years. The average age at death of the women from diseases of the respiratory organs was 64·7; of the men, 61 years. Men employed in trades died somewhat, but not much, earlier than those employed in the cultivation of the earth, the difference in favour of the latter being less than two years.

## SUMMARY OF THE INQUIRY.

General sum-  
mary of results.

THIS inquiry has demonstrated that an excessive prevalence of pulmonary diseases is associated with a great variety of conditions, some of which must clearly be regarded as exciting causes of these



diseases. With respect to others, it has been found impossible to obtain accurate and conclusive evidence that they produce diseases of the lungs, but there are strong grounds for supposing such to be the case. There is also a third set of conditions on which great stress was laid by various medical practitioners, and which may perhaps be regarded as having a tendency to produce these diseases. The conclusions deducible from the inquiry may therefore be arranged under the three following heads:—

A.—Conditions which this inquiry has shown to be direct causes of pulmonary diseases.

B.—Conditions so frequently associated with an excessive pressure of pulmonary diseases, that they may be regarded as, at least, indirect causes of these diseases.

C.—Conditions which, in all probability, co-operate in producing pulmonary diseases, but respecting the influence of which no conclusive evidence could be obtained.

A.—1. Inhaling an atmosphere loaded with mechanical impurities, such as fine dust of metal, stone, clay, or of certain animal and vegetable products; soot; and particles of flax, cotton or woollen fibre, exemplified in the cases of grinders of cutlery, needles and other steel articles; miners, quarrymen, stonemasons, china scourers, potters, turners of earthenware, makers of plaster-of-Paris moulds, hacklers of flax and Mexican fibre; sorters of wool, alpaca, and mohair; operatives employed in the manufacture of waste silk, and in the carding-rooms of cotton factories; wool-combers; workers in bone, ivory, horn, and mother-of-pearl, and makers of walking-sticks, and wooden handles for cutlery, umbrellas and parasols.

2. Inhaling an atmosphere containing carbonic acid or other gases unfit for respiration, or fumes arising from the combustion of gun-powder or of charcoal or other fuel, exemplified in the cases of miners and wool-combers.

3. Inhaling an over-heated and highly dried atmosphere, exemplified in the cases of the flat-pressers, and some other workers in potteries.

B.—1. Habitual exposure, during the hours of labour, to a hot and exceedingly moist atmosphere, exemplified in the cases of slip-makers in potteries and spinners of flax.

2. Working in ill-ventilated and over-heated factory-rooms, as in many manufactories of textile fabrics, in some of the decorators' rooms of potteries, in warehouses, and likewise in many establishments where young females are congregated together at work.

3. Exposure to vicissitudes of temperature, exemplified in the cases of the operatives in several kinds of factories and workshops.

4. A stooping or otherwise constrained posture while at work, exemplified in lace-makers, "throwers" of earthenware, certain classes of weavers, file-cutters, and silk-piecers.

5. Working continuously during many hours daily at a sedentary occupation, such as that of the glove-makers of Yeovil, decorators of earthenware, and welters and finishers of hosiery.

6. Working in ill-ventilated and over-crowded rooms, as in the straw-plat and lace schools of Berkhamstead, Towcester and New-

## Appendix.

### VI. Excessive mortality from lung-diseases.

#### General summary of results.



## Appendix.

—  
 VI. Excessive  
 mortality from  
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—  
 General sum-  
 mary of results.

port Pagnell, the winding-rooms of Leek, and the weaving-shops of Hinckley and Leicester.

7. Residing in dwellings so constructed that the bedrooms are badly ventilated, and the cubical space per head is inadequate to the preservation of health, such as are to be found in Berkhamstead and Saffron Walden.

- C.—1. Bleakness of climate ; a cold damp soil ; prevalence of fogs.  
 2. Marriages of consanguinity.  
 3. Habitual abuse of alcoholic stimulants.  
 4. Insufficiency of animal food.
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PUBLIC HEALTH.

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FOURTH REPORT

OF

THE MEDICAL OFFICER OF THE PRIVY  
COUNCIL.

WITH APPENDIX.

1861.

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Presented to both Houses of Parliament by Command of Her Majesty.

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LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,  
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.  
FOR HER MAJESTY'S STATIONERY OFFICE.

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1862.





TO THE LORDS OF HER MAJESTY'S MOST  
HONOURABLE PRIVY COUNCIL.

MY LORDS,

IN obedience to the Public Health Act, 1858, I have the honour of submitting to your Lordships, for presentation to Parliament, my Report of the proceedings which were last year taken under that Act.

I am,

My Lords,

Your Lordships' obedient servant,

JOHN SIMON.

Whitehall,

March 31, 1862.

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## MEDICAL OFFICER'S REPORT.

DURING the year 1861 the Lords of the Council, in exercise of the powers vested in them by the Public Health Act, 1858, took proceedings as follow :—

first, inquiries were made with reference to various LOCAL OUTBREAKS OF DISEASE, chiefly typhoid fever and small-pox ;

secondly, the superintendence of PUBLIC VACCINATION was continued ;

thirdly, in further systematic investigation of the LOCAL INFLUENCES WHICH OCCASION IN PARTICULAR DISTRICTS OF ENGLAND AN HABITUALLY HIGH MORTALITY FROM PARTICULAR DISEASES, inquiry into the *special causes which develop pulmonary disease in certain manufacturing districts* was continued ; and inquiry was also made into the special circumstances under which an *excessive mortality of young children* occurs in some districts of England.

And there were proceedings of minor importance under other miscellaneous heads.

### I. LOCAL EPIDEMICS.

The chief local inquiries made on account of outbreaks of disease had reference to *typhoid fever*. They were at Calstock, Over-Darwen, King's Langley, Montacute, Steyning, and Yeaton. Also on account of typhoid fever or typhus there was correspondence with the local authorities of Chapel-en-le-frith, Llanelly, Halifax, Great Ouseburn, Cropredy, Barton-on-Humber, North Meols, and Liverpool.\*

\* At Liverpool, the outbreak—fortunately not on a large scale—was of typhus. It was occasioned by the arrival of a filthy Egyptian ship, with a diseased and filthy crew. Some of the crew having been received into the hospital, and others having been to the public baths, typhus broke out in both these establishments. There resulted twenty-five cases at the hospital, and three cases at the baths, besides three other cases, of persons who had gone on board the ship ; thirty-one cases in all, leading to eight deaths. In giving to the Epidemiological Society of London an account of this lamentable occurrence, the Liverpool Officer of Health, Dr. Duncan, made the following statement respecting the ship and her crew :—The crew, numbering 476, consisted chiefly of Arabs, with a small proportion of the darker natives of Nubia and Abyssinia. The only European on board was the captain, a native of Austria. He received orders to procure a supply of European clothing for the crew at Malta, but in his anxiety to make a quick passage had omitted to do so. The weather during the lengthened voyage (thirty-two days from Malta) was cold and stormy, and the men, unaccustomed to the rigour of a northern winter, crowded below for warmth and shelter. Even those whose turn it was for duty had to be “driven” up on deck. About two hundred of the crew were convicts, who were brought on board in chains, and who had never been at sea before. These suffered severely from sea-sickness, and discharged the contents of their stomach and bowels

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I. Local Epi-  
demics.

On account of *small-pox* no local inquiries (apart from those presently to be mentioned, which were in superintendence of public vaccination) were deemed necessary; but the disease has been extensively prevalent in England; and there has been correspondence on account of it with the local authorities responsible for vaccination in the several unions of Warwick, Tendring, Newport Pagnel, Totnes, Scarborough, Aberayron, Axminster, Blything, Huntingdon, Cheltenham, Warrington, Carlisle, Truro, Cuckfield, St. Austel, Newton Abbot, Belper, Chesterfield, Aberystwith, Oundle, St. Columb, Northampton, Woburn, Potterspury, Norwich, Chelmsford, Launceston, Sheppey, Cardiff, Grantham, Basford, Peterborough, Wareham, Gravesend and Milton, Lutterworth, Plymouth, Bridgewater, Towcester, Bake-well, Eton, Liskeard, Taunton, Sevenoaks, Castleward, Tiverton, Falmouth, Leighton Buzzard, Thrapston, Bourn, and Plympton.

A single very small outbreak of *cholera* at Deptford led to correspondence with the local authority of that place.

At Coleby, in Lincolnshire, in consequence of an application from the locality, an inquiry concerning *diphtheria* was made; but, with that exception, *diphtheria* has not been matter of special proceeding.

To illustrate the circumstances under which the epidemics of typhoid fever occurred, I annex (Appendix No. I.) some extracts from the reports which were made by their Lordships' inspectors with regard to Calstock, Darwen, King's Longley, Steyning, and Yeadon, respectively. It will be seen that in all these places there was abundant filth to favour the rise or extension of disease. In Steyning the fatal outbreak was determined by the arrival of an already diseased person from Brighton; but it may well be questioned whether results equally disastrous could have arisen if the state of the place had been wholesome.

## II. PUBLIC VACCINATION.

### 1. *Inspection of Districts.*

In superintendence of public vaccination, my Lords, during the year 1861, ordered the inspection of 125 different unions or parishes, containing 687 vaccination-districts. These inspections were made in 223 districts by Dr. Seaton, in 142 districts by Dr. Buchanan, in 169 districts by Dr. Sanderson, and in 153 dis-

in all parts of the ship. The captain seems to have made no attempt to promote ventilation, and none to enforce cleanliness, beyond ordering the crew to be flogged in detachments of twenty or thirty each day. The ship was in such a state that, immediately after the removal of the crew, it was necessary to sink her in the graving dock, and to have her repeatedly washed down and cleaned, in order to remove the filth which covered her, and polluted the surrounding atmosphere. When the ship arrived in port, many of the crew were ill, and at least one had died. During their three weeks' stay, 127 were, at one time or another, on the sick list. There was conflict of medical opinion as to the nature of the illness among the crew. But that they carried the infection of typhus into Liverpool is admitted on all hands.



tricts by Dr. Stevens. Each inspector has made detailed reports with regard to all places inspected by him, and has also stated in one summary report the general results of his inspections. The four summary reports are appended. They describe the present state of public vaccination in Devonshire, Cornwall, Shropshire, Staffordshire, Essex, Norfolk, and Suffolk, and in parts of Derbyshire, Kent, and Somersetshire.

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II. Vaccination.

Although it would be superfluous for me to give here any abstract of the contents of the inspectors' reports, there is one broad fact made apparent by them, which it seems proper to bring forward for particular consideration :—this fact being, that, in an immense majority of the inspected districts, the existing contracts for vaccination were found to be practically worthless.

Extensive  
worthlessness  
of the present  
contracts.

The circumstances under which that result has arisen are as follows:—In 1840, when it was first enacted that vaccination at the public cost might be claimed of guardians and overseers throughout this country, and that guardians and overseers, in order to provide such vaccination for applicants, must, under the direction of the Poor Law Commissioners, contract with medical practitioners to be public vaccinators, the Poor Law Commissioners issued an instructional minute, advising boards of guardians as to arrangements for carrying this Act into effect. Points of special importance which, among others, had to be advised on, were these:—to *what number of performers* shall the new duty in any union be allotted? and *how many public attendances* shall each of them be bound to give for the performance of vaccination? The Poor Law Commissioners, in advising on these points, sought of course to give the utmost possible facility to persons desirous of getting gratuitously vaccinated. They wished “to take away all pretext from individuals for neglecting to avail themselves of the benefit of the contract,” and having special regard to this object, they gave advice which led to a very minute subdivision of public vaccination. They suggested that, as a general principle, guardians should “make the districts as small, and the number of vaccinators as great as possible;” that the contractor’s residence would often be the most convenient station which could be chosen for a district; that, where this was the case, the contractor should give special weekly attendance at a fixed hour, and should further give his services at any reasonable time, on personal application at his residence; that at other stations the number of attendances should “depend on the population who may be considered as likely to resort to each station;” and that the contractor should be at liberty, if he thought fit, to vaccinate persons at their homes, and charge for such vaccinations as though they had been performed at his station or residence. Again, 13 years afterwards, when the Compulsory Vaccination Act of 1853 came into force, the then Poor Law Board drew attention to the same points, and gave

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advice which tended to a still further subdivision of the public vaccination.

Later experience showed that, in those earliest endeavours to deal with the difficulties of providing a system of public vaccination, one very important consideration had been overlooked. It had been seen that great facilities for vaccination might be given by a large number of stations, and by a large number of surgical attendances:—apparently it had not been seen, or at least had not been insisted on, that multiplication of attendances beyond a certain point defeats the object of attendance, and that public vaccination in a district may often be difficult or inefficient, merely because the stations are too numerous, or the attendances at them too frequent. This consideration, and the consequences resulting from its non-observance, were adverted to in a memorandum,\* submitted by me to their Lordships in 1859, from which the following is an extract:—

“There is reason to believe that the performance of public vaccination in England is disadvantageously affected by its present extreme subdivision.

“For the satisfactory working of a public vaccinating-station, it is requisite that systematically on each vaccinating day two groups of cases should assemble there;—on the one hand, infants, who, having been vaccinated on the day-week preceding, are now (as the law requires) brought back for inspection, and are ready to furnish the vaccinator with lymph for his present proceedings;—on the other hand, infants brought for vaccination, who, if now vaccinated, will on the day-week following be brought back for inspection, and then in their turn contribute lymph for the benefit of further applicants. By the coming together of these two groups of cases, the vaccinator is enabled to vaccinate from arm to arm; a mode of proceeding, which, as a rule, is of great importance to his success.

“It is also requisite that each group of cases should not be too restricted in number. The careful vaccinator does not indifferently vaccinate from the arms of all infants brought back on the eighth day, but exercises selection among them; and facility for this selection cannot be afforded him, unless there be on each vaccinating-day an average return of several vaccinated cases. If his share of the local vaccination be either too small or too much subdivided among different stations and different days, the cases returning to him for eighth day inspection will on many vaccinating-days be too few for his purpose. On all such occasions, he must either omit to vaccinate those who apply to him, or (unless he have recourse to less eligible sources) must vaccinate them with preserved lymph, and incur the much greater chances of failure which belong to the usual modes of thus vaccinating.

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\* The memorandum, having been adopted by their Lordships, and by them communicated to the Poor Law Board, is printed in extenso in the Annual Report for 1859.



“ Ill-frequented vaccinating-stations—stations, that is to say,  
 “ where the total number of vaccinations, as compared with the  
 “ number of vaccinating-days, is too small for the local lymph-  
 “ supply to be continuously and properly maintained, are now a II. Vaccination.  
 “ very prominent feature in our system of public vaccination. Extensive  
 “ And this state of things is one of serious consequence ; not worthlessness  
 “ only as implying that at present a large proportion of the vac- of the present  
 “ cinations in England are performed under disadvantageous contracts.  
 “ circumstances, but also because, if it continue, the general  
 “ lymph-supply of England can scarcely fail to become insufficient  
 “ or deteriorated.

“ The excessive subdivision which leads to this result arises  
 “ in various ways. Sometimes, no doubt, the quantity of vacci-  
 “ nation to be performed within one jurisdiction has been  
 “ divided among too many performers. But still oftener it is the  
 “ case, that individual vaccinators have distributed their respec-  
 “ tive shares of the public duty among too many stations, or too  
 “ many vaccinating-days ; and in some cases the vaccinator  
 “ develops the inconvenience to its greatest extent by almost  
 “ or entirely disusing the appointed station, and habitually  
 “ performing his vaccinations under contract at the several  
 “ private dwellings of his patients.”

The inspections made during 1861 have brought prominently before their Lordships, as prevailing almost universally in the inspected districts, the evils to which the above passage refers. They almost universally have shown the subdivision of public vaccination pushed to an extent in which the object of the contract is defeated. They have shown that, as a rule, the attendances contracted for are such as would make habitual good arm-to-arm vaccination rare or impossible,—that often they are several times as numerous as the births in the same district, so that, even if every born child came to the public vaccinating-station, there would have been many fruitless attendances for each one vaccination performed. They have shown the division of districts to be such that the number of infants requiring to be vaccinated within one contractor's province is scarcely ever more than enough—very often far less than enough—to maintain first-rate continuous vaccination at even a single station, with a single weekly attendance ; yet, that the contract subdivides this amount of vaccination among several stations, and often binds the contractor to give at each station an amount of attendance which he must at once discover to be fruitless ; that under these circumstances the contractor soon comes to disregard a contract which he cannot carry into effect ; and that the vaccination of his district is then carried on under no other law than his individual notions of fitness or personal convenience. Details to this effect abound in each inspector's report, and the general result may be very briefly stated :—among 694 vaccination-districts, with regard to which this matter was inquired into, only 64 were found where the contractor professes to follow regularly the plan of

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Extensive  
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of the present  
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public vaccination prescribed by his contract; in at least 458 of the districts the plans of public vaccination prescribed by contract are confessedly quite disregarded; and in 252 of the districts the local registrar of births, in serving upon parents the statutory notice to have children vaccinated, either does not notify any fixed appointments for public vaccination, or notifies different appointments from those which the guardians have contracted for.

It is scarcely requisite to observe, that this extensive and extreme irregularity of public vaccination is fraught with evil consequences. Contracts which ought to regulate accurately the contractor's movements, and to form the basis for all local advertisements as to the performance of public vaccination, have come to be regarded (except their stipulations for payment) as of no obligatory force. The local arrangements for vaccination are thus practically withdrawn from all superior control; and though in many cases nothing could be worse than the authorized programme,\* yet the unauthorized arrangements are by no means always good. Doubtless this cause has been among the influences which have prevented the successful progress of vaccination in England.

Their Lordships have, therefore, brought the subject under consideration of the Poor Law Board, with whom, and not with their Lordships, rests the approval or disapproval of any proposed contract for vaccination.

2. Educational  
stations.

2. *Educational Vaccinating-Stations.*

During the year 1861, my Lords increased by three the number of educational vaccinating-stations recognised for the purposes of their Lordships' order of Dec. 1, 1859. The additional stations are,—one in Marylebone, one at Edinburgh, one at Glasgow. The first of these new stations was established in consequence of an application from St. Mary's Hospital, Paddington; the second and third in consequence of applications from the Faculty of Physicians and Surgeons of Glasgow, and the Presidents of the Royal Colleges of Physicians and Surgeons of Edinburgh, respectively.

Also, during 1861, the previously existing educational stations were inspected, and were found in satisfactory work.

A list of the educational stations now open is given in Appendix, No. III.

Supply of  
Lymph.

3. *Supply of Vaccine Lymph.*

A statistical summary of the proceedings of the National Vaccine Establishment during the year 1861 is (Appendix No. III.) annexed, and with it, for comparison, similar summaries for previous years.

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\* In one case which came under my notice, the contractor had engaged for habitual attendance at identical times in three different parishes of his district.



During 1861, the death of Dr. Hue, who had for nearly forty years held the office of Registrar and Treasurer to the Vaccine Establishment, gave my Lords occasion to consider, with the Lords Commissioners of the Treasury, whether the hitherto existing constitution of the Establishment ought to be continued. And the result of this consideration was, that my Lords, at the end of 1861, discontinued the Board of Superintendence which had till then existed, and took the affairs of the Establishment under their own immediate direction.

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### III. PLACES WITH HABITUALLY HIGH DEATH-RATES FROM PARTICULAR KINDS OF DISEASE.

Since 1858 there has been in progress, under their Lordships' orders, a systematic investigation of the circumstances under which particular districts in England suffer an excessive mortality from particular sorts of disease. The inquiries made under this head in 1861, and now requiring to be separately spoken of, were as follow:—

III. High local  
death-rates  
from particular  
kinds of  
disease.

- 1, an inquiry, continuing that of 1860, into the circumstances under which there is in certain districts a great adult mortality from lung-diseases; and
- 2, an inquiry into the circumstances under which there is in some districts a great mortality of young children.

#### 1. *Excessive adult mortality from lung-diseases in certain districts of England.*

Inquiry as to locally prevailing causes of lung-disease was made, during 1861, at the following important centres of industry:—Birmingham, Aston, Nottingham with Radford and Basford, Wolverhampton, Merthyr Tydfil, Abergavenny, Coventry and Blackburn.

During 1860, inquiry for the same purpose had been made in other places and neighbourhoods, as follows:—Stoke-upon-Trent, Wolstanton, Bromsgrove, Alcester, Sheffield, Penzance, Redruth, Reeth, Pateley Bridge, Macclesfield, Leek, Leeds, Bradford, Stroud, Melksham, Leicester, Hinckley, Preston, Towcester, Newport Pagnell, Berkhamstead, Yeovil, and Saffron Walden.

The inspections of 1861 were, like those of 1860, made by Dr. Greenhow; and on the present occasion, as on the last, I sub-join *in extenso* (App. No. IV.,) Dr. Greenhow's valuable report of the facts which he elicited. The result of the two years' inquiry is now under their Lordships' consideration; and the following statements will explain the present complexion of the case.

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1. Lung-dis-  
eases.

Origin and  
scope of the  
inquiry.

i. The inquiry starts from a statistical basis. An investigation of the death-registers had shown that in certain districts of England—districts which are specially the seats of particular kinds of industry—grown-up men or women die from diseases of the lung, or from some of such diseases, three times, four times, even six times as abundantly as in other districts of England. And the object of the inquiry was to trace this effect to its causes. Especially—since the great local excesses of lung disease go with certain industrial relations of the people, it was necessary to ascertain, with regard to each inspected place, what definite causes of lung-disease are involved in the particular local industry.

The occupations, which have thus had their sanitary circumstances reviewed, are some of the largest branches of popular industry :—*cotton-work*, *silk-work*, *flax-work*, and *wool-work*, in their several respective departments, at Preston, Blackburn, Macclesfield, Leek, Coventry, Pateley Bridge, Leeds, Bradford, Stroud and Melksham; the *manufacture of watches* at Coventry; the *making of hosiery* at Leicester, Hinckley, Nottingham, Radford and Basford; of *straw-plait* at Tring and Berkhamstead, and of *lace* at Towcester, Newport Pagnell, Nottingham, Radford and Basford; *tin-mining*, *copper-mining*, *coal-mining*, *iron-mining* and *lead-mining*, at Redruth, Penzance, Wolverhampton, Merthyr Tydfil, Abergavenny, Reeth, and Pateley Bridge; the *smelting of metals* and the *making of metallic instruments*, large and small, at Merthyr Tydfil, Abergavenny, Wolverhampton, Bromsgrove, Alcester, Aston, Birmingham, and Sheffield; also, at the latter two places, the *making of miscellaneous knick-knacks* from pebbles, shells, ivory, horn, wood gutta percha, &c.

General results  
of the inquiry.

ii. The results of this very large inquiry are, in one sense of the word, satisfactory. They answer the question which claimed investigation. They establish in detail what had appeared generally in the statistics. They explain how it is that the inspected occupations are so hurtful to those who follow them,—how it is, that, in much of our best national industry, the workman, by reason of his work, loses some considerable part of his life.

Want of venti-  
lation in in-  
work-places.

a.) In the first place, apart from whatever unwholesome influences belong to the special nature of this or that industrial process, it has appeared to be the general fault of the inspected in-door employments, that the workpeople are apt to pass their day—often a very long day—in rooms which are more or less unwholesome through want of ventilation. In a very large proportion of cases this unwholesome condition prevails to such an extent, that deaths by phthisis and by other tubercular and scrofulous diseases might be expected abundantly to result from it.

The evil occurs under different industrial circumstances :—one industry is followed in the houses of the work-people;



another with more or less aggregation in common work-places. But throughout the whole scale, from the humblest cottage industry even up to the highest developments of our factory system, amid infinite differences of occupation, the same great removable evil abounds. And in scene after scene of honest industry and independence, the medical eye sees monotonously this one terrible shadow of suffering and death.

For details illustrating the general statement I refer to the inspector's reports;—to what he says of the life led by straw-plaiters, lace-makers and glovers at Berkhamstead, Tring, Towcester, Newport Pagnell, Nottingham, Radford, Basford and Yeovil; of the life led by watch-makers at Coventry; of the life led by button-makers, jewellers and various knick-knack-makers at Birmingham and Sheffield; of the life led by stocking-makers, especially such of them as work with the old knitting frames, at Leicester, Nottingham, Radford, Basford and Hinckley; of the life led by pottery artisans, especially by the decorators of earthenware, at Stoke and Wolstanton; of the life led by factory operatives employed on cotton, silk, flax and wool, at Preston, Leeds, Bradford, Pateley Bridge, Macclesfield, Leek, Stroud, Melksham, Coventry and Blackburn, and by operatives, not under the Factory Act, employed at some of these places in particular branches of the same industries.

Duly to appreciate the evil of an unventilated work-place in any of the cases referred to, one must have under consideration the whole life of the artisan who suffers from it, and all the circumstances of his industry. One must remember that, in most cases, either the artisan's ill-ventilated work-place is also his ill-ventilated dwelling-place, or else the dwelling-place to which he goes for his rest is as ill-ventilated as the work-place which he leaves; that during a great part of the year the work-place has artificial light in it, in many cases gaslight, for some hours of the day, and in some cases has its atmosphere vitiated by other products of combustion; that in factories during winter the commonly adopted method of warming is one which itself makes the air unpleasant, if not hurtful, for breathing; and that in many branches of industry (in instances to be hereafter adverted to) good ventilation is essential as a safeguard against evils which are special to the employment—essential for the removal of an injurious dust, or for the abatement of an oppressive temperature. One must remember, too, that the artisan's indoor employment is essentially dull and cheerless, is in a large proportion of cases sedentary, and is in some cases combined with an almost deforming constraint of bodily posture,—that the working day thus spent is commonly of at least 10 hours duration, and sometimes extends to 12, 14, and even 16 hours,—that such life, at its best, is not wholesome,—that with the scanty or monotonous bodily exercise which it implies, with the seclusion from what is beautiful and animating in external nature, the

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Atmospheres  
which specially  
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lungs.

artisan's standard of health is necessarily low,—that probably his occupation, even without aggravating circumstances, gives him, proportionately to his length of daily work, a heightened liability to tubercular disease,—and that, among the aggravating circumstances which may indefinitely increase this evil, probably none is so effective as the bad ventilation of his work-place.

b.) In the second place, it has appeared that in many of the inspected employments there are special sources of danger to the lung, by way of direct irritation ; and that against these various special dangers little effectual precaution is taken.

Thus, in some gigantic branches of our national industry (such as the textile manufactures, the manufacture of earthenware and china, the manufacture of steel and iron, and in many less extensive occupations) work-people in large numbers—sometimes nearly all who are employed in particular departments of the business—break down prematurely with lung-disease, under pressure of the mere dustiness of their occupation. For, in the cases referred to, the “dustiness” in the occupation implies that the artisan, during his dust-making work, draws at each breath into his air-tubes a notable quantity of finely divided metal, grindstone, flint, clay, shell, ivory, bone, charcoal, wool, cotton, flax, silk, or other material which is in use ; and, putting aside all question of the immediate inconvenience thus occasioned (which presently ceases to attract the artisan's attention) the gradually accumulating consequences of the habitual irritation are—primarily, confirmed bronchitis, and secondarily, in the graver cases, an irreparable destruction of lung-texture.

Again, in the operation of mining there is, as will presently be shown in detail, special danger to the lung, from influences which, if not very successfully dealt with, render the subterranean atmosphere both chemically and mechanically unfit for respiration. And so imperfect hitherto has been the adoption of safeguards against this danger, that, with one very notable exception, miners, as a class—and the class includes in England alone more than 300,000 workmen—break down prematurely with bronchitis and pneumonia, caused by the atmosphere in which they labour.

In other branches of industry there is the influence of working in an atmosphere much altered by heat, and of alternating between that atmosphere and the common, perhaps wintry and inclement, outside atmosphere. In many of the inspected occupations, bronchitis, attributable to this influence, appears to be extremely frequent:—both in cases where the hot industrial atmosphere is very moist and steamy, as in the slip-making department of potteries, and in the so-called “roving,” or wet-spinning department of flax factories ; and also in cases where the industrial atmosphere is high dried by heat,—especially if the dry heat be (as it commonly is) an attendant circumstance of defective ventilation, or co-operate with other influences likely to irritate the



lungs (as in dusty departments of earthenware making and of textile industry) or be combined with the hurtfulness of accumulating gases from combustion, as in the instance of hand-woolcombers, who work with unchimneyed furnaces beside them.

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iii. In order to illustrate the preceding observations, it may be convenient that I refer, with some detail, to a few typical cases where such evils as I have adverted to attain their largest dimensions. And for this purpose I submit the following instances:—

III. High local death-rates from particular kinds of disease.

1. Lung-diseases.

a.) In metallic manufacture, the grinders and polishers of steel are the worst sufferers. Their work—abundantly illustrated in the inspected districts of Bromsgrove, Alcester, Sheffield, Aston, and Birmingham—consists in giving final shape and smoothness to the edges, points and surfaces of innumerable steel instruments—knives, forks, razors, scissors, chisels, needles, saws, files, scythes, swords, bayonets, gun-barrels, fish-hooks, gimblets, spindles, fire-irons, &c.; and as this final shaping and glazing of hard metal is done by the rub of revolving grindstones and emery wheels, dust is of necessity produced in every step of the process,—dust, which may be extremely fine, but is of almost adamantine hardness. The diffusion of this dust into the air of work-places is not nearly so great in wet-grinding as in dry-grinding; for in wet-grinding the surface of the wheel as it revolves dips into water, and carries thither a large proportion of the detritus which otherwise would be diffused into the air; but even in this case there continues a perceptible diffusion of the dust, and unfortunately the grinder suffers a special inconvenience in the damp to which he is habitually exposed. Moreover, the dust of mere grinding and polishing is by no means the only dust of the work-places in question. For, first, each grindstone, when new, must itself be rough-ground into shape by the workman; and afterwards, perhaps twice or thrice a day, its worn surface must be fresh roughened for use; and in these processes of “razing” and “hacking,” as they are called—processes which dry-grinding and wet-grinding have in common—great clouds of grit, rising from the wheel, first densely envelop the operator and then diffuse through the work-place.

Illustrations of the production of industrial lung-disease.

Grinders and polishers of steel.

It has long been known that the spray of these processes makes a deadly atmosphere for men who breathe it; and against this great evil some not inconsiderable pains have been taken. To a great extent it is now the case that the dry-grinder's wheel moves in a partial wooden casing, from within which the dusty air is constantly being drawn by a revolving fan into an air-shaft away from the workman. Yet, notwithstanding this contrivance, the employment continues greatly hurtful;—first, because the ventilated wheel-box is used only in dry-grinding; secondly, because in dry-grinding it is not universally used; thirdly, because, even where it is used, there still escapes into the work-place a considerable residue of dust from the processes

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of grinding and glazing ; and, fourthly, because it has no sensible influence on those clouds of dust which the processes of razing and hacking engender.

The report made of the health of grinders is, that few of them work continuously for many years without suffering more or less from the occupation. At first there is oppression at the chest, followed by shortness of breath, cough, and expectoration ; symptoms which advance slowly, and attract little notice, till they get aggravated by catarrh ; after a while, the bronchitis which they indicate gets complicated with solidification of the lung ; and eventually, it is said, the lung undergoes changes of an ulcerative kind. Among 21 grinders, aged thirty and upwards, whom Dr. Greenhow examined at Birmingham, 15, though still at work, were suffering more or less from shortness of breath, cough, and expectoration,—some of them so severely as to be almost incapacitated for labour.\*

b.) In the manufacture of earthenware, the chief sufferers are the china-scourers and certain of the potters.

China-scourers  
and potters.

China-scourers remove loose flint-powder from the baked china ; and in doing so (partly by brushing, partly by rubbing with sandpaper) they send much flint-dust into the atmosphere about them,—a dust, which is lighter and floats more obstinately in the air, in proportion as the earthenware is fine. This dust, inhaled into the lungs of the workpeople, is a terrible irritant to the bronchial surface which it invades. The women (for the occupation is a female one) soon get habitual shortness of breath, with cough and expectoration ; very often they have bleeding from the lungs, sometimes also from the nose ; and their chronic disease is from time to time accelerated by more acute catarrhal attacks, to which they are particularly subject. Comparatively few china-scourers continue very long at the employment. All who continue at it become,† sooner or later, “asthmatical.” Those who relinquish it in time are said occasionally to regain perfect health ; but for the greater number the mischief is re-

\* Not many grinders suffering from the characteristic disease could be induced to submit to stethoscopic examination ; but of those whom Dr. Greenhow examined at Sheffield he reports,—“Several were suffering from chronic bronchitis, and others, “ in a more advanced stage of the disease, afforded evidence of consolidation of the “ lungs. The cases examined were not sufficiently numerous to determine the “ frequency of the latter condition, and the only patients who, on examination, “ afforded evidence of the existence of cavities in the lungs, were young men under “ 30 years of age.”

† “ A scourer who had worked eight years, and was suffering from chronic “ bronchitis, said, that four other scourers who were employed in the same room had “ died from the effect of the occupation since she had commenced it, and that a fifth “ was then at the point of death. In a third pottery, a woman who had worked ten “ years at the occupation asserted, that about 12 other scourers in the same shop had “ died since she entered it. Out of 13 china scourers, belonging to six or seven “ different potteries, whose evidence was taken, only four were in good health ; nine “ were suffering in consequence of their occupation. Of the latter, three were suffer- “ ing from an advanced stage of chronic bronchitis, attended by great difficulty of “ breathing ; four had suffered from hæmoptysis ; and the others all had more or less “ shortness of breath, cough, and expectoration. The eldest of these women was 50 “ years of age, two were over 40, and four were under 30 years of age. One of the “ latter was among those whose health had given way under the employment.



ported to be irretrievable. Against the danger of this occupation scarcely any provision has been made. In one of the potteries visited (says the inspector) "the china was placed upon a small moveable turn-table, for the purpose of being scrubbed with sandpaper, an arrangement by which the dust was kept at a greater distance from the mouth of the scourer than when held in the hand. In another pottery the china was being rubbed within the opening of a sort of canvas tube or wind-sail, up which a draught of air carried a considerable portion of the lighter dust. In most potteries, however, no special precautions are employed to prevent the dispersion of the flint dust into the atmosphere."

Potters (including in this term all the various shapers of earthenware,—flat-pressers, hollow-ware-pressers, throwers, turners, and sagger-makers) are exposed in different degrees to the influence of a dusty atmosphere,—all in a less degree than the china-scourers, but some of them, especially the flat-pressers, in a degree which is most injurious to health.\* The mechanism of the nuisance to which they are exposed is this:—shavings of the potters' dough fall abundantly about the work-place; they rapidly dry upon the floor, more rapidly as the room is more hot; they are then easily convertible into powder; and this powder rises into the air of the room in proportion as the business there is one of much bustle and movement. How flat-pressers come to be especially sufferers by dust, and how, not only in their case, but in that of potters generally, the evil varies in amount with varying arrangements of a work-place, may be illustrated by the following quotation:—"Articles made by flat-pressers are sent, immediately, to dry in a closet or stove heated by a furnace. These stoves are placed in the workshop, and frequently, especially among plate-makers, close to the operatives, so that the atmosphere in which they work is of an elevated temperature, and very dry. The ware is carried into the stoves by boys, who are very young, and are kept running to and fro all day, thereby filling the atmosphere of the shops with dust. The quantity of dust varies according to the cleanliness of the place. Some workshops are swept daily, others only once a week, and of course the operatives employed in the latter are more exposed to inhale dust than those in the former. The temperature of the workshops depends partly upon the sufficiency of the supply of moulds. When the men are well supplied with them, it is not necessary to hasten the process of drying, and the stoves need not be so highly heated. When, on the other hand, there is a deficiency of moulds, the potters endeavour, by way of compensation, to

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\* Out of 37 flat pressers, taken indiscriminately in several potteries, 20 suffered habitually from bronchial irritation (or potters' asthma, as it is termed); and only 17, most of them younger men, declared themselves to be healthy; out of 16 hollow-ware pressers, 8 only considered themselves healthy; the others were all suffering, more or less, from dyspnoea and cough. Out of 14 turners, only 4, and out of 16 mould-makers, only two, were asthmatical."

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“hasten the process of drying, in order that the moulds may again be soon ready for use.”

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from particular  
kinds of dis-  
ease.

1. Lung-dis-  
eases.

Cotton carders.

c.) As regards textile manufactures, illustration may be taken from cotton-factories and flax-factories.

In cotton-factories, the carding-rooms are by far the most injurious. They employ many operatives—sometimes even a third of the whole establishment. All employed in these rooms inhale a dusty atmosphere, with much cotton-fibre diffused in it. Some of them are exposed to special aggravations of the nuisance; the card-strippers, for instance, who remove adherent cotton from the carding-engine, and who during this process surround themselves with an extraordinary amount of dust; and still more the card-grinders, who, in the daily process of grinding the engines, share the liability of ordinary dry-grinders to inhale a metallic dust. The influence of the ordinary carding-room atmosphere on persons regularly employed in it is such, that, apparently, few carding-room operatives reach fifty years of age without having acquired an amount of chronic bronchitis which at no distant time disables them. Yet evidently the evil is in great part controllable. Partly, no doubt, it varies in degree according to the quality of cotton which is in work; but also it greatly varies according to the arrangements of the work-place,—is lessened in proportion as the room is lofty and ventilated, in proportion as the carding-engines are closely covered, and in proportion as means are used to modify the more dust-producing processes. For example;—in some factories the carding-engines, when about to be ground, are taken out of the room; in some, the grinding is done by a machine which supersedes manual labour, and to a great extent saves the grinder from metallic dust; and in some there are carding-engines so constructed that with them no stripping process is necessary. Also, it was remarked by a manufacturer, that “a large proportion of the dust and flue which escape into the atmosphere of the rooms might be intercepted and carried away by means of properly constructed flues and fans, but that the expense, both of the machinery, and of additional steam-power to work it, is a barrier to their being employed.”

Flax workers.

In flax-factories, the production of disease is terribly great. A very irritating dust, more or less abundant according to the quality of flax, is produced in the processes of hackling, carding, line-preparing and tow-spinning. The casual visitor who breathes this dust gets at once a sense of oppression at the chest; and the operative who habitually breathes it rarely attains mid life without suffering more or less from bronchial disease. Of 107 operatives whose evidence was noted by Dr. Greenhow (operatives taken by him quite indiscriminately—young and old, well-looking and ill-looking—but all employed in more or less dusty departments of the manufacture) 79 were suffering or had suffered from the bronchial irritation; and in 19 of the 79 there had been hæmorrhage of the lungs—in some cases again and again. In certain of these dusty departments, the suffering is



greater than in others:—hacklers, especially hand-hacklers suffer very greatly; among 27 of them whom Dr. Greenhow examined, 23 were diseased, and 5 had had hæmorrhage from the lungs. Many of the older operatives “are seen at a glance to be short-breathed; the rounded shoulders, emaciated frames, prominent eyes, and laborious wheezing respiration, all clearly show that they suffer habitually from dyspnœa; indeed it is marvellous to see men in the condition of some of the hand-hacklers still able to continue at their labour; a circumstance probably ascribable to the very slow and gradual progress of the disease.”

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The effects of the dusty work-place are not confined to the lungs:—often the stomach gets deranged by the quantity of swallowed dust; often ophthalmia (especially at the margin of the eyelids) is produced; often the voice becomes hoarse; and sometimes there is bleeding from the nose. Not a few operatives desert the occupation in consequence of the misery it occasions them: but new sufferers succeed; and many get a certain degree of acclimatization, with which they go on, patiently bearing the gradual progress of disease, till presently, in mid-life, or soon afterwards, their employment brings them to helplessness or death.

In flax-factories, as in cotton-factories, the fatal nuisance of dust is, to no small extent, controllable. Not only will it be greatly affected by the general ventilation of the work-place, but machines may be so covered as to prevent much dispersion of dust from them, and ventilating flues may be so arranged that dust is drawn away almost in the moment of its production. In some cases the inspector saw appliances of this kind in operation. But in other factories, says his report,—“either no means at all, or very inadequate means, are employed for preventing the dispersion of dust into the atmosphere, and, of course, the operatives suffer in consequence of this inattention of the master.”

d.) In our mining industry there is only one broad exception Miners. to the rule, that miners, as a class, break down prematurely with lung-disease. That exception is of signal importance; so also are some minor differences of degree which may be named; and to these I will directly return. But first, with regard to that which unhappily is the rule,—what are the circumstances under which the miner's lung-disease is contracted?

The miner, like the indoor operative, often spends his day in an ill-ventilated work-place. But the non-ventilation from which he suffers is associated, in its existence and its consequences, with conditions special to the subterranean employment, and far more complex than those which belong to the non-ventilation of common work-places. The air in which he works is air which for his safety's sake ought pre-eminently to be ventilated; for in most cases, not only the exhalations of human labour, but gases indigenous of the mined earth, or gases from gunpowder

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burnt in rock-blasting, tend incessantly to gather round him at his work, as an atmosphere quite unfit for respiration. Nor is it always only on that account that ventilation is important to the miner; for against the dust and smoke which abound in many mining operations, against the heat which in deep mines grows with every considerable descent, and against the terrible danger of fire-damp, ventilation is the one possible corrective. The air in ill-ventilated mines must be very greatly more impure than the air of ill-ventilated above-ground places. So considerable must be its defect of oxygen, so considerable its excess of carbonic acid, that, not only must it be insufficient, often almost urgently insufficient, for healthy respiration, but in many cases, I apprehend, must interpose an appreciable physical obstacle to the free circulation of blood through the lungs. And the same air, besides being chemically insufficient for respiration, also carries with it into the miner's lungs more or less irritant material,—material, which, though the air were ever so well oxygenated, would itself tend to produce bronchitis—grit, namely, and soot and the acid fumes of combustion. The miner, meanwhile, is not at sedentary employment, like many indoor operatives, but is doing arduous muscular work for many consecutive hours,—work which claims full service from all his apparatus of respiration.

When, on the one hand, it is considered how very hurtful to the lungs must be the atmosphere of an ill-ventilated mine, and when, on the other hand, it is considered that, without much expenditure of skill and money, the ventilation of mines is not possible, nor even with such expenditure always easy,—there could be no wonder though the miner almost invariably got lung-disease. And in fact, under the too common circumstances of the employment, his health-history is this:—that even at an early age the respiratory mucous membrane begins to suffer; that for a time there may be only hoarseness or wheezing, or slight oppression at the chest; that shortness of breath, cough and expectoration succeed, and gradually become habitual—the expectoration of course being characterised by an admixture of whatever dust or soot has entered and is irritating the lungs; that, if there be personal predisposition to tubercular phthisis, this disease very early develops itself; that, barring phthisis, the bronchitis goes on, probably often with more or less super-addition of pneumonia, and sometimes with the complication of emphysema; that the sufferer becomes very susceptible of acute catarrh, which, with successive attacks, rivets more and more closely the hold of the chronic disease, and aggravates at last, often to a fatal amount, the urgency of its previous symptoms; that presently the ordinary complications of long-continued bronchitis arise—heart-disease (which perhaps is in some cases specially promoted by special circumstances in the occupation) and, with heart-disease, various dropsical symptoms.

Happily, as I have observed, to run this painful course is not indiscriminately the law of mining existence. One class of miners—



that of the Northumberland and Durham colliers, forms a striking exception. So far as existing mortuary statistics enable a judgment to be formed, these miners, as compared with other classes of the community, do not suffer any important excess either of pulmonary or of other disease ; and, were it not for the chances of violent death which surround them, their employment might be deemed fully compatible with an average expectation of life. On the other hand, the rule, to which those colliers are the exception, —the rule, that employment in mines causes pulmonary disease, and leads to premature disablement and death, is illustrated in the mortuary statistics of Redruth, Penzance, Abergavenny, Merthyr Tydfil, Wolverhampton, Alston, Reeth and Pateley Bridge, and in the facts which their Lordships' inquiry has elicited with regard to the sanitary state of the mining populations in those places respectively ; though, again, even among these suffering populations, the pressure of pulmonary disease varies not inconsiderably in its amount.

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The healthiness of the northern coal-miners, and the lesser degrees of suffering among some of our other miners, correspond to the different degrees of ventilation in the mines where those miners are engaged. In the northern coal-mines good ventilation is the rule ; in the copper-mines and tin-mines of Cornwall, in the lead-mines of Reeth, Alston and Pateley Bridge, and in the iron-mines and coal-mines of Wolverhampton, Abergavenny and Merthyr Tydfil, good ventilation is the exception. Yet even with regard to the latter classes of mines testimony is borne to the effects of relatively good ventilation ; not only as evidence that in recent times ventilation has almost universally been improved, and therewith the miner's occupation been made less fatal to him ; but likewise as evidence on the comparative ventilation and comparative unwholesomeness of mines.

Thus, among the Welsh miners, it was said that “ in some  
“ mines the smoke [of gunpowder-blasting] is rapidly carried  
“ away by the ventilating current, while in others it lingers for  
“ a long time. It was distinctly stated of one mine, that the  
“ smoke is swept away from the face of the work, where the  
“ men are most exposed to inhale it, in a few minutes after the  
“ explosion, whilst the atmosphere of other mines was said to be  
“ scarcely ever free from smoke, which only disappeared by what  
“ the miners expressively call ‘ dying away.’ The miners em-  
“ ployed in the former were reported, by the manager, the  
“ surgeon, the overman, and by some of the men themselves, to  
“ be nearly exempt from miner's asthma ; while it was ascer-  
“ tained of some of the latter, that almost all the men become  
“ asthmatical as they advance in life. These are, indeed, extreme  
“ cases, the one being the best and the others probably among  
“ the worst ventilated mines in the district ; but there are also  
“ other mines of every intermediate variety as regards the  
“ efficiency of their ventilation.”

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Thus, again, in the Wolverhampton district (where there was much difference in the ventilation of mines) evidence was repeatedly given,—that the men suffer in proportion to the dust and powder-smoke diffused through the atmosphere of the mine,—that this depends on the greater or less inefficiency of the ventilation,—that the well-ventilated mines are much less injurious to health than such as are ill-ventilated.

And equally, among the lead-miners, evidence to the same effect was given; evidence which is the more important because they, of all miners, are probably the most suffering class. Differences indeed were spoken of, dependent on geological circumstances of the mine,—that mines in some strata; would be dustier than mines in other strata; and no doubt this is the case. But the great difference was the difference of ventilation,—a difference which of course makes itself more felt in proportion to the dustiness and other impurity of the mine. As it was better or worse, the miner's time for disablement varied. In one mine which was visited, all the men, it was stated, became short-breathed before the age of forty; while in another mine, few, it was said, suffered materially till after fifty. And in other like ways it made itself obvious in its effects:—"Men who have  
" previously shown themselves but slightly affected, being  
" thereby less able to resist the deleterious influences attendant  
" on mining than men in health, often break down rapidly on  
" being removed to a 'wind-less,' that is an ill-ventilated place  
" of work. On the other hand, timely removal to a better situ-  
" ation often proves an effectual means of checking the progress  
" of the complaint. Several lead-miners who, feeling their  
" health injured by their occupation, had either worked for a  
" time at coal-mining, or at some employment on the surface of  
" the earth, asserted that they had by this means very much  
" mitigated their ailments, some of them having subsequently  
" been able to resume their original occupation."

e.) With reference to the unwholesome circumstances under which domestic manufactures are commonly carried on, the cases of the straw-plaiters at Berkhamstead and Tring, of the glove-makers at Yeovil, of the lace-makers at Towcester and Newport-Pagnell, and of many silk-operatives at Leek, seem to me deserving of particular attention; the more so, because women and children—in some cases very young children—are the principal sufferers in these manufactures. Detailed information as to these branches of industry is in the Appendix (No. VI.) of my last year's report; but it will be convenient to quote here some passages on the subject.

Straw-plaiters.

At Berkhamstead and Tring women and children are engaged in straw-plaiting. "The manufacture is carried on at  
" home . . . . . The cottages of the labouring classes in Berk-  
" hampstead are usually small, ill-ventilated, and very frequently  
" dirty; this applies more particularly to the modern houses,  
" which are worse constructed and worse ventilated than the



“ older ones . . . . . The cottages of Tring are, upon the whole,  
 “ larger and better than those of Berkhamstead . . . . . Even  
 “ these larger dwellings are sometimes too small for the number  
 “ of their inmates . . . . . Young and even married women,  
 “ when they are able to do so, work from 10 to 14 and some-  
 “ times even to 15 hours a day; the average certainly being 12  
 “ hours.” Except in fine weather, when the doors of the  
 cottages are kept open, and the women sometimes sit in the open  
 air, or walk about at work, these long hours are devoted to a  
 sedentary occupation in badly ventilated cottages of very  
 limited dimensions. “ Children begin to learn the manufacture  
 “ of straw-plait very early; often at four years of age. In  
 “ the first instance they are generally taught by their mothers;  
 “ but at about five years of age, and sometimes even sooner, they  
 “ are sent to the plaiting schools, where each child has an  
 “ allotted task to perform during the day. The work at these  
 “ schools is done on behalf of the mothers, who provide the straw,  
 “ and fix the amount of plait which their children are expected  
 “ to make during the day, paying the schoolmistress a certain  
 “ sum per week for her superintendence. The hours of atten-  
 “ dance at these schools are long [by rule 8 to 9½ hours; but  
 “ liable to be prolonged for children who have not done their  
 “ allotted task]; and the schools are held in rooms almost in-  
 “ variably over-crowded, the atmosphere of which must in winter  
 “ be much impaired by the respiration of so many persons.”

At Yeovil “ the manufacture of gloves is chiefly carried on  
 “ in the dwellings of the industrial classes. The rooms are fre-  
 “ quently small, low, and deficient in ventilation; the cottages  
 “ often having neither back doors nor back windows . . . . .  
 “ The domestic branch of the glove manufacture is almost exclu-  
 “ sively carried on by women and girls, who work in the small,  
 “ ill-ventilated rooms of their cottages, and sit very close at  
 “ their employment during many hours of the day. It is said  
 “ that sometimes when work is very pressing they devote as  
 “ many as sixteen hours a day to their labour; but it was  
 “ established without doubt that they commonly work 12 or 13  
 “ and frequently 14 hours out of the 24. Indeed it was plainly  
 “ stated by some of the more intelligent women, that female  
 “ glovers who have to earn their own maintenance must work  
 “ very diligently and sit very closely to their labour. The occu-  
 “ pation is entirely of a sedentary nature, and the women sitting  
 “ upon low seats constantly stoop much over their work, which  
 “ is fixed in an upright stand called an engine. . . . . The  
 “ women engaged in the manufacture of gloves in their own  
 “ homes rarely go out of doors. . . . . Young girls begin the  
 “ business of glove-making sometimes as early as the age of  
 “ seven, but commonly at that of eight or nine years. It is  
 “ usual for mothers to set their children a certain amount of  
 “ task-work, which must be completed before the close of the  
 “ day.”

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Lace-makers.

At Towcester and Newport-Pagnell the female population is largely engaged in lace-making, "which is in both places a domestic occupation. . . . . The dwellings of the labouring classes both in Towcester and Newport Pagnell are often very small, over-crowded, and ill-ventilated. Many of them being without back doors or windows, do not possess the means of thorough ventilation. The bed-rooms are often entered one through the other, and in many instances there is no chimney in either of the sleeping apartments. . . . . Even in many of the cottages of larger dimensions the internal atmosphere is stagnant at night, owing to the absence of chimneys, or to the fact of their being closed up to exclude draughts of air. Such rooms always have a close, stifling smell to strangers coming from the open air, even though they be sufficiently capacious. . . . . The women employed in the manufacture of lace work for 9, 10, or 12 hours per day, and occasionally even longer. The work is done in the cottages during the greater portion of the year . . . . . During the winter, when the women work entirely within doors, every crevice or chink through which a draught of air could find entrance is carefully stopped. The women are said very rarely to leave the immediate vicinity of their dwellings, and to take but little exercise in the open air, and that for the most part late in the evening, regardless of weather, and often very imperfectly clad. The inmates of neighbouring cottages sometimes assemble in the same room to work in company, particularly at night, when artificial light is required, a single candle thus serving for several workers, each of whom has a globe filled with water, supported on a wooden stand, placed between the candle and her work, upon which it concentrates the light . . . . . Their sedentary mode of life renders the women liable to suffer from cold feet in the winter season; to obviate which annoyance many of them are accustomed to place a sort of chafing dish, filled with embers from the fire, or, it was said, with ignited charcoal, beneath their dress, a practice which, of course, tends to vitiate the atmosphere of their small ill-ventilated cottages. Children are, if possible, even more exposed than adults to some of the pernicious influences attendant upon the occupation of lace-making. Girls begin the work as early as, and sometimes earlier than, seven years of age. Partly for the purpose of learning the business, but chiefly in order to be under the superintendence of a mistress, they are usually sent to a lace school, where they are expected to make a given amount of lace in the course of a day. The hours of attendance in these schools vary somewhat, according to the age of the children, and the custom of the place. . . . . From eight to ten hours per day appears to be the more usual duration of labour in these schools both in Towcester and Newport Pagnell. As in the plaiting schools, so here likewise, the children must complete their appointed task before leaving, and, failing to do



“ this, are detained until it is finished. The schools are held in  
 “ ordinary cottages, and are often much overcrowded. . . .  
 “ From the position which they occupy while at work, the chil-  
 “ dren employed in this trade very soon become round shouldered  
 “ and narrow chested. . . . Lace is made upon circular  
 “ pillows or cushions, stuffed with straw which rest at one side  
 “ upon a sort of wooden frame, and at the other upon the knees of the  
 “ worker, who [except where a special contrivance is used] is thus  
 “ compelled to maintain a more or less constrained position. . . .  
 “ The cushions are usually placed so low that the worker is com-  
 “ pelled to stoop over her work, and the arms being habitually  
 “ brought forward, in order to enable the women to handle the  
 “ bobbins, lacemakers are apt to become round-shouldered, and,  
 “ their chests being contracted, the act of respiration, particularly  
 “ when the cushion rests on the knee, is not freely and efficiently  
 “ performed.”

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In Leek, exclusively of persons employed in silk-mills under the Factory Act, “ a great number of very young children,  
 “ from eight years of age upwards, work at home, or in wind-  
 “ ing-rooms, or other work-places, which do not come within the  
 “ jurisdiction of the inspectors. In some of these places children  
 “ are employed to turn the wheel that moves the machine, an  
 “ employment at which they are engaged for at least 10 hours  
 “ in the day. Thus, in a thread manufactory, 24 women and  
 “ girls were employed in the winding-room at the time of visit.  
 “ The wheels that moved the winding machines were turned by  
 “ two boys, of the respective ages of 8 and 9 years. Probably it  
 “ would not pay to employ steam-power in so small an esta-  
 “ blishment; but its absence enables the proprietors of these  
 “ small factories to escape the restrictions imposed by the Factory  
 “ Act. About 21 persons were employed in another small  
 “ winding establishment. The wheel was here turned by a man;  
 “ but 10 little girls, some of them not more than 8 or 9 years  
 “ of age, and only one or two as old as 11, were working 10  
 “ hours a day. In a third establishment of the same kind, 18  
 “ or 20 of the operatives were girls between the ages of 8 and  
 “ 12 years. Including men, women, and children, 51 operatives  
 “ were here crowded into a space which, including that occupied  
 “ by machinery, consisted of 10,000 cubic feet, thus affording an  
 “ average of less than 200 cubic feet per head. The machines  
 “ were moved by a wheel turned by a man; ventilation was  
 “ most imperfect; in fact, practically, there was none, for the  
 “ windows opened so exactly in a line with the heads of the  
 “ workers, that they could not bear them open while at work.  
 “ The duration of labour was 10 hours per day. There are many  
 “ other work-places of the same kind in Leek, in each of which  
 “ from five or six to a dozen persons are employed; but most of  
 “ these places may be regarded as rather in the light of domestic  
 “ work-rooms than of factories. . . . Both weavers and

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“ ‘piecers’ (*i. e.* the women and children who tie together the  
“ ends of silk which breaks while winding from the ‘swifts’ on  
“ to the bobbins) work in a constrained position. Silk-weavers  
“ sit at their looms, with the body leaning forwards, and the lower  
“ part of the chest firmly pressed against the wooden beam on  
“ which their work is rolled, thus compressing both the stomach  
“ and chest; their arms are habitually brought forwards while  
“ at work, and they are thus apt to become round-shouldered  
“ and narrow-chested. . . . Weavers, like many other  
“ operatives, are liable to suffer from working in close, ill-venti-  
“ lated work-places, either in factories or at their own homes.  
“ . . . . Piecers, and especially children, besides often working  
“ in badly ventilated rooms, stoop much at their work. They  
“ work in a standing position, and have a certain amount of  
“ exercise in moving backwards and forwards along the frame  
“ for the purpose of tying the broken ends, but in doing this  
“ they usually have occasion to stoop forwards. The precise  
“ influence of this position cannot be accurately estimated,  
“ seeing that it is associated with working in close, ill-ventilated  
“ rooms; but piecers appear from the death register to contri-  
“ bute an undue proportion of the mortality from pulmonary  
“ diseases. Much of the work on which piecers are employed  
“ is done at home, or in winding shops, not worked by steam  
“ power, and, in this case children of both sexes, but principally  
“ girls, are employed irrespective of the restrictions either as  
“ regards hours of labour or the age at which they are put to  
“ work, imposed by the Factory Act. . . . The deaths of  
“ young girls employed in the silk manufacture have been very  
“ numerous in both Macclesfield and Leek; but there are no  
“ accessible data from which to calculate the proportion their  
“ deaths bear to those of the rest of the population of the same  
“ age and sex. . . . The sleeping apartments in the  
“ cottages at Leek are frequently destitute of chimneys, and  
“ the windows, opening but imperfectly, their ventilation is  
“ most inadequate; and yet, upon the whole, the dwellings of  
“ the labouring class are superior to those in many agricultural  
“ districts.”

eventability  
of industrial  
lung-disease.

iv. With regard to the all important question—whether it be possible, without impeding the proper march of industry, to reduce those great attendant evils which their Lordships’ inquiry has demonstrated,—I am happy to say that the inspector’s reports teem with statements which justify, for many of the occupations, a decidedly affirmative answer, and for the other occupations at least a very hopeful opinion.

That, where domestic manufacture is concerned, the domestic ventilation might be amended, and the domestic crowding be restricted, may, I suppose, be taken as self-evident. And that the employment of children in certain of these manufactures might



be so amended in its conditions, as no longer to be almost cruel in amount and unwholesomeness, is also evidently an attainable improvement. That where factory-work is concerned, the factory ventilation might be amended, and factory crowding be restricted, is shown by the many contrasts of good and bad which abound in the inspector's reports,—contrasts between factories in any one given place and devoted to any one given industry,—contrasts which show a well-ventilated and comparatively wholesome factory side by side with one which may even stink\* with the exhalations of its inmates.

That the bronchitis-producing influences special to particular branches of industry, may also, without detriment to the respective industry, be largely reduced or abolished, is shown by similar evidence. There are the contrasts of good and bad, the differences of bad and worse, to which I have adverted in speaking of the particular occupations. In mining, for instance, there is the comparative perfection of the north-country coal-mines to point to ; and there are the differences, well known in their respective districts, between well-ventilated and ill-ventilated mines—copper-mines, lead mines, tin-mines, iron-mines and coal-mines—in Wolverhampton, Abergavenny, Merthyr Tydfil, Penzance, Redruth, Pateley Bridge and Reeth. Similarly, in hackling-rooms, grinding establishments and the like, there are cases where the injurious influence is left at its maximum ; others where it is considerably controlled. So again in the slip-making department of potteries, there is at least one case (that of Messrs. Copeland's establishment) where the injurious process of slip-boiling is dispensed with, in favour of another process which inflicts no injury on the workpeople.†

Why, then, it may well be asked, do the various possible improvements, which would save so much human life and prevent so very much human suffering, remain, comparatively speaking, unadopted ?

The sources from which reform could be initiated are three :—the voluntary action of employers of labour ; the demands and insistence of workpeople ; the coercion of law ;—and respecting each of these, separately, something explanatory must be said.

First, as regards the employers of labour, they, in many instances, have given ample proof of good-will :—in every one of the injurious occupations, different establishments present differ-

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Why are preventive measures against industrial lung-diseases not adopted ?

\* See Appendix, p. 183.

† It deserves notice that the extreme subdivision of labour, which marks our highly artificial system of manufacturing industry, is specially apt to illustrate the hurtfulness of particular industrial processes. Where only some small part of a manufacturing process is directly hurtful in its nature, the hurtfulness of that part might easily escape observation, or indeed might practically be of little importance, if every workman in the factory took his turn of it, as of other parts of the manufacture, and thus had for his share but a small exposure to the influence. But, under our existing organization of labour, the china-scourer is always china-scourer, the flax-hackler always flax-hackler, the steel-grinder always steel-grinder ; and thus the evil effect of the occupation goes on accumulating in the individual. See also footnote at p. 31.

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ent degrees of injuriousness; and, in those establishments where the better conditions exist, this superiority denotes that means of improvement have been voluntarily adopted by enlightened and kind-hearted employers. On the other hand, in many instances, the employer seems not to have given any thought whatever to the matter—seems to be unconscious of any particular responsibility in regard of it—seems not to know, or for practical purposes, not to care, that he makes his commercial profits with an unjust and wasteful consumption of his neighbour's life. Again, in a considerable number of intermediate cases the employer has attempted to mitigate the unwholesome influences under which his workpeople are suffering, and has failed through want of knowledge, as especially in the many unskilful endeavours which have been made to amend the ventilation of work rooms.

Secondly, as regards the workpeople themselves, it is true that in a certain sense the matter is in their hands,—that they might rebel against needlessly unwholesome conditions of labour—might refuse to work in places where there is not reasonable care for their lives. But this theoretical power of the workman is in present practice a nullity. He cannot exact his sanitary rights. He could not do so unless he were one in a combination of claimants; nor even then unless, further, he had sufficient knowledge to shape demands for definite remedies. These conditions do not seem in any degree likely to be realised. Indeed, except with the most notorious occupational diseases, the workman seems but partially aware of the fatal circumstances under which he labours. The steel-grinder knows the cause of his "rot," and the potter or miner the cause of his "asthma;" but the many indoor operatives who contract phthisis through unwholesome conditions of labour are probably ignorant of the danger they incur. Even where the mischief is most flagrant, the workman sometimes has a short-sighted hesitation about the remedy—is apprehensive, lest, if his occupation were made harmless to him, his weekly wages would be made smaller. And especially he is jealous of new introductions of machinery, which in some cases might supersede hurtful processes of hand-labour. Then, too, the progress of disease is slow,—phthisis scarcely making itself felt till it has stealthily got an irresoluble hold on life,—bronchitis a mere nothing for years, till gradually, very gradually it grows to the pitch of chronic suffocation; both diseases, so small at first—so insidious; and the beginning artisan young and careless; and death far in the distance. Doubtless there are very many instances where an individual artisan seeks work by preference in the more wholesomely conducted establishments of his business; and in cases where personal precaution counts for something, the individual workman is here and there found taking care of himself; but the inquiry has shown little of this kind of influence operating on compact masses of workmen. And it must be remembered that among those who suffer from un-



wholesome industrial conditions, many defenceless persons are found,—many women, many mere boys and girls, many children.

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Thirdly, as regards the intervention of any legally constituted authority,—no existing law is more than very imperfectly applicable to procure the mitigation of unwholesome industrial conditions.

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Defects of ventilation are, in theory, dealt with under the Nuisance Removal Act; for, under that act, Justices can order proper means to be taken (and among such means “ventilation” is expressly included) for the abatement of any condition which is *injurious to health*\* in any “messuages, lands, or tenements, “whether open or enclosed, whether built on or not, and whether “public or private;”† and consequently it is part of the responsibility of local authorities under the Act (and it also lies within the competence of individual complainants‡) to move Justices to enforce the ventilation of work-places, wherever non-ventilation is demonstrably injurious to health. But, in practice, these powers are hitherto almost unapplied; partly because the magnitude of the evil is but most imperfectly appreciated, either by local authorities and justices, or by the slowly suffering artisans themselves; and perhaps still more—at least in regard of factories, for another reason. In any proceedings under the Nuisance Removal Acts, an official complainant should be ready to state in precise terms what remedy he asks the justices to apply. Now, to prescribe suitable ventilation for a work-place, there must be used a fair amount of intelligence and discrimination. The fittest means of cure are often not obvious to an unskilled person, nor uniform for all cases; and with ill-adapted ventilation there may be as much immediate annoyance as with non-ventilation. An average inspector of nuisances cannot dictate ventilation off hand, as he would direct the clearance of a dust-bin. Justices, acting without skilled advice, cannot themselves order in detail particular means of ventilation; nor could they reasonably order in general terms “that ventilation be provided to the satisfaction of the local authority,” unless evidently this authority were acting with skilled advice. Thus, it seems, the evil is left unabated, lest perhaps any offered remedy should be worse than it;—much of the evidence painfully showing, that, where sometimes good intentions have been at work, they have commonly frustrated themselves through want of knowledge,—that, again and again, where a work-place has had inlets advisedly made for ventilation, these have been made with so little judgment that the work-people could not suffer them to continue.

1. Lung-dis-  
eases.

Against the other sources of industrial disease to which the report has referred, no law yet pretends to make provision.

\* See definition of nuisance in Section 8 of the Act 18 & 19 Vict. c. 121.

† See Section 2 of the just recited Act.

‡ See 23 & 24 Vict. c. 77. § 13.

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ease.

1. Lung-dis-  
eases.

No present  
prospect of  
much improve-  
ment.

Questions  
which the evi-  
dence suggests  
with regard to  
amendatory  
legislation.

Thus, almost without exception, the sanitary circumstances of labour are left to take their chance of such improvement as the employer may be willing to offer, or the employed be able to exact. How partial, how imperfect, are the improvements thus realized, the submitted evidence abundantly shows. And how ineffectual they are to prevent the wasteful consumption of life, is shown by those sad statistics from which the investigation commenced.

Practically, it seems certain that an indefinitely long time must elapse before better results can be brought about by the agencies which are now in operation; and that, year after year, as far forward as any present judgment would willingly speculate, the same terrible waste of adult life must, with no great mitigation, continue, unless the Legislature see fit to provide, by special enactment, for more wholesome conditions of labour.

The suggestions, which, in this point of view, I would beg leave to submit for consideration are the three following:—

First,—industrial establishments, in their relation to the convenience and health of persons in whose neighbourhood they stand, are already subject to the Nuisances Removal Act. If it be duly certified that nuisance is caused by effluvia from “any “manufactory, building, or place used for any trade, business, “process, or manufacture,” and that the person by or in whose behalf the work is carried on has “not used the best practicable “means for abating such nuisance, or preventing or counteracting “such effluvia,” the local Justices, moved either by the local authority under the Act, or by any inhabitant of the place, may enforce a penalty which increases with each successive conviction:—but subject to these restrictions;—first, that Justices may suspend judgment, on condition that the person complained against undertakes to adopt, within reasonable time, such means as they judge practicable and order to be carried into effect for abating the nuisance; secondly, that the person complained against may appeal to Quarter Sessions, and this court may, if it see fit, cause the case to be removed for determination to the Court of Queen’s Bench; thirdly, that the penalty (which on a first offence is 40s. and increases with each subsequent offence) shall not in any case be increased beyond the sum of 200*l.* Is there any sufficient reason why industrial establishments, in their relation to the health of persons labouring in them, should not be made subject to the spirit of this enactment? It would indeed be unreasonable to expect unconditionally that a mine should be perfectly ventilated, or flax-hackling be perfectly without dust; but it would not be unreasonable to require, and it would seem quite indefensible to refuse, that, in these and like cases where masses of industrious life are jeopardised, the employer of labour should use “the best practicable means” to protect his labourer from harm.

Secondly,—certain industrial establishments are subject to Government inspection, and some, to a very limited extent, are



regulated by Act of Parliament. Factories which have steam-engines or water-power, and also bleaching and dying works, are inspected in the interests of those who work in them; so likewise are coal-mines and iron-mines. Is there any sufficient reason why these precedents should not be followed with other industrial establishments,—followed at least wherever there is proof that life is endangered by the occupation? There is cruel overwork\* of women and children in premises which have not the steam-engine or water-power qualification to be inspected. There is abundant causation of premature death in mines which are neither coal-mines nor iron-mines. And potters, grinders, carders, hacklers, not to mention hosts of other artisans, may, any of them, show the same claim as miners—the claim of grievous physical suffering—to have the special circumstances of their industry subjected to Government superintendence.

Thirdly,—in the above-cited cases, where Government inspection is made, the inspector, if he finds things wrongly or illegally done, sets in motion whatever means the special law under which he acts has provided for procuring correction or redress. Is there any sufficient reason why the inspector's power of thus proceeding should not be extended to common sanitary faults in whatever work-place he inspects,—why, for instance, the factory-inspector should not be authorized to move Justices to order amendments of ventilation for a factory? The unboxed machinery, against which he now has authority to move the magistrate for penalties, is indeed a real danger to life and limb; but even though every mutilation which results from it were to be counted as a death, the deaths from unboxed machinery would probably count as nothing in comparison with those which the unventilatedness of factories occasions. And a skilled inspector's intervention would supply the one condition which is hitherto absent, for getting the Nuisances Removal Act applied to the lessening of that gigantic evil.

In respectfully submitting these suggestions, I will venture to express my belief that if they were deemed fit for acceptance, and were practically carried into effect, the resulting gain would be among the very amplest which a legislature can hope to realise through the application of preventive medicine. For the

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\* In this report I have said little of over-work in itself; nor is any useful object to be gained by considering at present what might be a proper duration of daily labour if all the industrial circumstances were good. Those circumstances being what they are, "work" in the inspected occupations has almost universally been found to be "over-work;" and in some cases the duration of work has been such as, under the best conceivable industrial circumstances, would have been monstrous. Where any branch of industry is (either naturally or through adventitious circumstances) insalubrious, the injury to health of course increases with the extension of hours of labour; and accordingly, in proportion as any labour includes in itself special conditions against life, so, if life is to be cared for, the work-day of the particular occupation, as compared with the work-days of healthy occupations, ought to be of short duration. See also preceding foot note, p. 27.

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canker of industrial diseases gnaws at the very root of our national strength. The sufferers are not few or insignificant. They are the bread-winners for at least a third part of our population. Their struggle, at best, is not an easy one. That they have it made needlessly hard and painful for them, dignified while it is by their infinite patience and courage and mutual helpfulness,—that men and women, while at work for children and parents, have causes of disease indolently left to blight them amid their toil, and to drag them down from the independence which they cherish, is surely an intolerable wrong. And to be able to redress that wrong is perhaps among the greatest opportunities for good which human institutions can afford.

2. Infantine  
diseases.

2. *Excessive Mortality of Infants in some Manufacturing Places.*

The remaining inquiry ordered by their Lordships during the year 1861—an inquiry into the sanitary circumstances of the infantine population in certain centres of industry, has grounds of interest almost identical with those of the last-mentioned inquiry.

In the last report\* which I made to the late General Board of Health,—a report which, as regards its subject matter, may be regarded as introductory to the annual reports which I have now the honour of submitting to the Privy Council, I drew attention to the fact that in different districts of England there are enormous differences of infantine mortality,—such differences that children in some districts die at perhaps four or five times the rate of children in other districts; and I stated my belief that these wide differences of death-rate are “due to the varying prevalence of two local causes:—

“first, to differences of degree in *common sanitary defects* of residence; some places abounding more than others in the foul air and foul water of undrained, unpaved, unscavenged, unwashed, unlighted, unventilated, localities and houses;—

“and secondly, to *occupational differences* among the inhabitants; there being certain large towns where women are greatly engaged in branches of industry away from home; where, consequently, the home is ill kept; where the children are little looked after; and where infants who should be at the breast are improperly fed or starved, or have their cries of hunger and distress quieted by those various fatal opiates which are in such request at the centres of our manufacturing industry.”

The inquiry now reported on was especially intended to throw light on the second of the just-mentioned influences. Dr. Green-

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\* Papers relating to the sanitary state of the people of England, 1858.



how, whom under their Lordships' orders I instructed to make it, combined with his inquiry into industrial diseases at Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny, an inquiry into the circumstances of infant life in the same places respectively. His report (Appendix No. IV.) is subjoined. It gives a very sad picture of suffering and demoralization, caused by the present circumstances of female employment in factories. It corroborates very exactly the opinion above expressed as to the probable causes of the high mortality of infants in places of female factory-occupation. And it shows that while the infants perish under the neglect and mismanagement which their mothers' occupation implies, the mothers become to a grievous extent denaturalised towards their offspring.

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The following quotations tell the main facts of the case:—  
 “ Factory women\* soon return to labour after their confinement. The longest time mentioned as the average period of their absence from work in consequence of child-bearing was five or six weeks ; many women amongst the highest class of operatives in Birmingham acknowledged to having generally returned to work at the expiration of a month ; and it was stated by several medical men of great experience, and by other witnesses in Coventry and Blackburn, that the factory women even sometimes return to work as early as eight or ten days or a fortnight after their confinement. . . . . Mothers employed in factories are, save during the dinner-hour, absent from home all day long, and the care of their infants during their absence is entrusted either to young children, to hired nurse-girls, sometimes not more than eight or ten years of age, or perhaps more commonly to elderly women, who eke out a livelihood by taking infants to nurse. Young girls, aged seven or eight years, are frequently removed from school for the purpose of taking charge of younger children while the mother is absent at work, and are sometimes said to return, on the death of the child, evidently rather pleased that this event has

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\* “ The contrast between the treatment of infants by their mothers in Merthyr Tydfil and Abergavenny and in the factory towns was most remarkable. The mortality among young children in these Welsh districts is said by the local medical practitioners to be much augmented by mismanagement, more especially by exposure to inclement weather and by improper feeding ; but these habits proceed from ignorance, and not from neglect, the mothers, for the most part, being devotedly attached to their offspring. The houses are kept very hot within doors by means of large fires, and the mothers are accustomed to carry their children about with them wherever they go. Even children suffering from bronchitis, which is very prevalent in this bleak region, are habitually carried from the hot air within the house into the cold external atmosphere, whenever the mother has occasion to go out of doors. Another cause of infantile illness, and especially of convulsions, which occasions a large mortality in some of the Welsh districts, was said to be the custom of covering infants entirely over when laid in a cradle or bed. The air breathed by the infant while asleep is on this account imperfectly changed, and this may perhaps be one cause of the great prevalence of nervous diseases among the children of these districts.”



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“ released them from their toil. . . . Children left by their  
 “ mothers during so great a part of the day are fed in their  
 “ absence on artificial food, which is for the most part unsuited  
 “ to their digestive powers. The children are thus almost en-  
 “ tirely spoon-fed, the mother being able to nurse them only at  
 “ night, perhaps hastily early in the morning before setting out  
 “ for the mill, again at dinner-time, and no more until evening.  
 “ . . . Pap, made of bread and water, and sweetened with sugar  
 “ or treacle, is the sort of nourishment usually given during the  
 “ mother's absence, even to infants of a very tender age, and in  
 “ several instances, little children, not more than 6 or 7 years  
 “ old, were seen preparing and feeding babies with this food,  
 “ which in such cases consisted only of lumps of bread floating  
 “ in sweetened water. . . . . Illness is the natural consequence  
 “ of this unnatural mode of feeding infants. . . . . Children who  
 “ are healthy at birth rapidly dwindle under this system of mis-  
 “ management, fall into bad health, and become uneasy, restless,  
 “ and fractious. To remedy the illness caused by mismanagement,  
 “ various domestic medicines are administered, more particularly  
 “ some kind of opiate, such as Godfrey's cordial, or laudanum.  
 “ Wine, gin, peppermint, and other stimulants are likewise often  
 “ given, for the purpose, as alleged, of relieving flatulence, their  
 “ actual effect being, however, rather to stupify the child. The  
 “ quantity of opiates sold for the purpose of being administered to  
 “ infants in some of the manufacturing towns is very large. . . .  
 “ Women when remonstrated with on the subject of drugging  
 “ their children with laudanum, say that they must keep their  
 “ infants quiet, as their husbands and elder children, who have to  
 “ work during the day, cannot do so if disturbed at night.  
 “ Besides that sold by regular druggists, much opiate is also  
 “ sold in most manufacturing towns by grocers and small shop-  
 “ keepers, and a considerable quantity by druggists under other  
 “ names, such as “Infants' Bottle,” &c. Indeed there seems to  
 “ be no doubt that the habitual administering of opiates to  
 “ infants must be included among the causes of a high infantile  
 “ mortality in certain manufacturing towns, not only on account  
 “ of an over-dose being occasionally given, but also because  
 “ infants kept in a state of continual narcotism will be thereby  
 “ rendered disinclined for food, and be but imperfectly nourished.  
 “ . . . . Parents who thus entrust the management of their  
 “ infants so largely to strangers become more or less careless and  
 “ indifferent about them, and as many of these children die the  
 “ mothers become familiarised with the fact, and speak of the  
 “ deaths of their children with a degree of nonchalance rarely  
 “ met with among women who devote themselves mainly to the  
 “ care of their offspring. Without entirely concurring in the  
 “ opinion expressed by several persons in Nottingham, that child  
 “ murder is common in that town, it may yet be affirmed with-  
 “ out hesitation, from the facts brought to light during this



“ inquiry, that a greater degree of indifference is manifested  
 “ towards their children by the female operatives of manu-  
 “ facturing towns than is found to be the case elsewhere. . . .

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“ Abundant proof of the large mortality among the children of  
 “ female factory operatives was obtained during the inquiry. An  
 “ operative of the better class in Birmingham reported that he  
 “ collects money for the expenses attendant on the deaths of  
 “ children among the workers in a factory where 150 women are  
 “ employed, and that he believed 10 out of every 12 children born  
 “ to the married women in this factory die within a few months  
 “ after birth. Many married women were questioned, as oppor-  
 “ tunity served, in the several factories visited, regarding their  
 “ families, the number of children they had borne, the number  
 “ that survived, and the manner in which they were brought up.  
 “ The evidence of these women tallied exactly with that of other  
 “ persons. . . . It was frequently found that two-thirds  
 “ or three-fourths of the children borne to these women had died  
 “ in infancy.”

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It is scarcely necessary to observe, that against this state of things, there is no resource in any present provisions of law. And the root of the evil is an influence with which English law has never professed to deal. Money is on one side ; penury on the other. Domestic obligation is outbidden in the labour-market ; and the poor factory-woman, who meant only to sell that honest industry of hers, gradually finds that she has sold almost every thing which other women understand as happiness. But the root of this evil is perhaps out of reach of law—certainly out of reach of remedies which I am competent to advise. And I will only suggest, with reference to one part of the consequences, that factory-masters who employ adult female labour would do something to mitigate the sufferings and demoralization which result from it, if they would establish within their factories, under well-advised regulations, nursery-rooms, where working mothers might leave their infants in some proper and kindly charge, and might, as often as necessary, have access to them.

With reference to the matters discussed in the present and last preceding sections of my Report, I have not on this occasion adduced any precise statistical evidence. Statistics, generally justifying the assertions I have made, are given in my former reports, especially in the above-mentioned “Papers relating to the sanitary state of the people of England.” But I am glad to say that very shortly those statistics will not be the most recent which can be adduced. Eighteen months ago, with their Lordships’ authority, I brought under the consideration of the Registrar General that very great help would be given to the progress of sanitary investigation if he (having regard to then approach-

Statistics for  
 the exhibition  
 of special mor-  
 bific influences.

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ing new census of the population, and to the facilities which it would afford for the calculation of accurate death-rates) would cause to be prepared a *digest of all the mortuary returns relating to the intercensual period 1851-1861*, with such distinctions of *age and sex*, and such classification of *causes of death*, as would enable the student to estimate, at least with approximate precision, how far each district of England is affected by the several chief sorts of morbid influence. The Registrar General, with his invariable willingness to assist inquiries of this description, resolved to make the suggested compilation. I have reason to believe that it is now in an advanced stage of preparation, and will at no distant period be completed. Ample means will then exist, and be universally accessible, for measuring the amount of mortal injury which different local influences inflict on different sections of our population. In relation to this important object, and in relation to those local inquiries which it is their Lordships' function to make, the value of the promised compilation will be such as to mark a new era for sanitary studies in England.

JOHN SIMON.



## APPENDIX.

### NO. I.—EXTRACTS from REPORTS relating to OUTBREAKS of TYPHOID FEVER, viz. :—

#### 1. On the FEVER at CALSTOCK, by Dr. BRISTOWE.

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I soon ascertained that, though the parish is of great extent, and contains several villages, the present outbreak of fever had been confined almost exclusively to one village, Gunnislake, and its offshoots, Higher, Middle, and Lower Dimson, New Bridge, &c. I ascertained, further, that fever of the character now prevailing had, in the experience of those best informed, been an annual visitant during the autumnal season; and, though often showing itself mildly, had more than once, as on the present occasion, assumed the proportions of an epidemic. It raged with unusual severity three years ago. In former years, however, its ravages had not been limited, as now, to Gunnislake and its immediate vicinity; other villages had from time to time suffered, though generally in a less degree than Gunnislake itself. But I learnt, on the most conclusive testimony, that no fever case whatever had recurred in the village of Calstock for more than two years. . . .

I. Local inquiries as to outbreaks of typhoid fever.

1. Calstock, by Dr. Bristowe.

Altogether, 213 cases of the fever have been on the books of Dr. Sellors and Mr. Woodd, and of these 12 have been fatal. It seems, however, that there was much diarrhoea during the earlier part of the epidemic among those who were not regarded as fever patients, and that some few individuals have been under the care of the village chemist and druggist; so that probably the numbers given above are not an accurate record of the whole amount of disease due to the fever-poison. From its commencement in August, the epidemic increased gradually until October, it was at its height during that month and November, declined somewhat in the earlier part of December, and at the time of my visit was manifestly on the wane. There were then about 54 cases under treatment, but the majority of them were convalescent, and the few recent cases appeared generally mild.

Of the nature of the prevailing fever there can be no doubt. The diarrhoea by which it was generally characterised, and which existed contemporaneously with it, the protracted convalescence, the absence of satisfactory evidence of contagion, and other peculiarities pointed out to me by the medical men of the place, or observed by myself in the course of my investigations, abundantly proved it to be true "typhoid fever." And I may add that there is every reason to believe that the fever which had raged on so many previous occasions was of the same nature.

The parish of Calstock occupies an area of 6,133 acres, and at the last census contained a population of 7,060 inhabitants.

Besides many groups of cottages, the parish contains several villages, of which, the largest and most important are Calstock and Gunnislake. These lie within two or three miles of each other on the banks of the Tamar. There is little difference between them, either in size or as regards the condition of the population.

Gunnislake, situated chiefly on the irregular slope of a hill, contained 15 or 16 years ago less than a hundred souls. But since that date numerous mines have been sunk in the neighbourhood, and the inhabitants have rapidly increased in numbers, so that at the last census they amounted to 2,500.

One of the most remarkable features in the place is the want of privy accommodation. In some few cases indeed two or three privies, with cesspools, are supplied for the use of eight or a dozen houses. But in the great majority of instances, even in the centre of the town,

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no accommodation of any kind is provided, and hence the adult male population defæcate habitually in the gardens or in the road, and the women and children make use of the *pôt de chambre*, which they empty over the garden, on the dust heap, or in any other convenient spot. Occasionally a wooden erection may be seen having the external aspect of a privy, and used as such, but with only a cross-bar or plank for a seat, and no cesspool whatever; the excrement being allowed to accumulate there and diffuse itself thence for an unlimited time, or until it is required for manure.

Efficient sinks and house-drains are wanting; and in place of them nearly every house has a pit, often if not generally adjoining it, in which every kind of filth (slops, decaying animal and vegetable matters, excrement) is thrown, and allowed to accumulate and ferment, not for a period limited by its complete removal, but until it is thought convenient or desirable to spread it as manure over the adjoining plot of ground.

Every house nearly has its pigsty, and rows of houses have often their rows of sties. In the less crowded localities these are often far removed from the houses, but by no means habitually so. In the central parts they are necessarily contiguous. Pigs when very numerous, however cleanly kept, must almost of necessity create a nuisance; but it is scarcely possible to conceive anything more filthy than the pigsties in Gunnislake usually are. They seem as rarely cleansed as the open cesspools themselves, and probably only at the same time and for the same purpose.

I have pointed out, above, that no efficient house-drains exist. It is necessary to state, however, that about two years ago the Nuisance Removal Committee, which then consisted of energetic members, contemplated the complete drainage of Gunnislake, and laid down at some considerable expense a system of main drains, commencing in several suitable points in the village, passing down or near its principal streets, and terminating by a single outlet in the adjacent river. But the activity then displayed, and the expense incurred, raised a powerful opposition. On the first opportunity the committee was reconstituted; and the result has been, that all drainage works, public and private, have been discontinued; and the pipes which were originally laid down, and required but a small outlay on the part of the landlords, and a still less outlay on the part of the parish, to render them effectual, have been allowed to remain almost entirely useless.

Starting with the knowledge which we already possess of the source of typhoid fever, there can, I think, be little hesitation in assigning the true cause in the present instance. The site of the village of Gunnislake would strike one as being, and unquestionably is, exceedingly healthy. The water supply, if not in quantity, is certainly in quality better than that of most country villages. . . . Overcrowding, though occasional, is scarcely a marked feature in the village. . . . No one, however, can take even a cursory glance at the village without being struck by the unusual number of filthily kept pigs, and of putrid and overflowing refuse pits and heaps, and by the general absence of privy accommodation with its attendant evils. And in this accumulation of abominations one cannot fail to recognise the threefold efficient cause of the epidemic constitution of the place. Doubtless something may be attributed to the habits of the inhabitants themselves, but household and personal uncleanness is almost a necessary consequence of such external filth as surrounds them, and is in a measure forced upon them. It is a striking and significant fact that the village of Calstock, which, as before pointed out, is almost in every respect a counterpart of Gun-



nislake, has during the last two years enjoyed a perfect immunity from fever, and that this immunity followed on the almost complete drainage of the place, which was effected rather more than two years since, and on the removal of a very large proportion of the pigs, which at that time infested it.

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I. Local inquiries as to outbreaks of typhoid fever.

1. Calstock, by Dr. Bristowe.

## 2. On the FEVER at OVER DARWEN, by Dr. GREENHOW.

Cases of fever had appeared from time to time in various parts of the Blackburn Union during the present year anterior to the outbreak at Over Darwen.

2. Over Darwen, by Dr. Greenhow.

The outbreak of the epidemic in Over Darwen commenced about the last days of August or the first days of September. The three resident medical practitioners agreed in stating it to have been very sudden, that it spread very rapidly, and was not restricted to any particular part of the town. It was, indeed, so extensive and sudden that Mr. Wraith, the Union surgeon, had at least 100 cases under his care in the first few days of the epidemic, and 300 within the first three weeks, and the other medical men, together, must have had an even larger number. No accurate records having been preserved, it was found impossible either to ascertain the residence of the earliest cases, or the exact number of persons attacked by the disease, but the first death, that of a young woman aged 19 years, who worked in a factory, took place on September 13th. Between this date and October 22d the deaths of 35 persons, either from typhus, typhoid, or gastric fever, were entered in the books of the Registrar for the sub-district.\* From the already stated absence of records it was impossible to ascertain the number of persons attacked by the epidemic, but as nearly as can be estimated, it has probably exceeded a thousand in Over Darwen, exclusive of about fifty cases at Ryal; and though the disease had partially subsided, fresh cases were still occurring, and many old cases were yet under treatment at the time of the inquiry.

The fatal cases have been registered under the names of typhus, typhoid, and gastric fever, but the history of the disease and the cases seen prove it to have been typhoid fever; at least, the severer cases were well marked typhoid fever, but the milder ones were of a somewhat ambiguous character, and might, perhaps, be properly termed febricula.

Over Darwen has already been spoken of in this Report as having been in a very filthy and neglected condition at the outbreak of the epidemic, and, though it may be questionable whether the state of the town caused the fever, it may be assumed from experience in other places that it at least offered conditions favourable to the spreading of the disease. The Public Health Act was applied to Over Darwen in 1854, and the Local Government, Act was subsequently adopted by the Local Board of Health. A very excellent set of bye laws was also passed by the Board in April 1859. Hitherto the latter appear to have been a dead letter, for, without exception, all those, of which the observance or neglect could be noted during the inspection, appear to have been habitually disregarded. Nuisances very dangerous to health existed in many parts of the town not-

\* A note from Mr. Kenyon, clerk to the Over Darwen Board of Health, mentions that eight additional deaths took place between the above date and November 8.

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2. Over Darwen, by Dr. Greenhow.

withstanding that the Board was represented to have been unusually active for two or three weeks previous to the inquiry. Many of the streets of Over Darwen are unpaved, and not being provided with proper channels, water and liquid refuse is permitted to make for itself a channel in the readiest direction. In other streets there were accumulation of ashes and filth. There appears to be no proper system of scavenging; and night soil, ashes, and other refuse are allowed to accumulate in uncovered receptacles certainly for many months—it was asserted, in one place, for several years—without removal. The circumstance that these receptacles often serve for several houses adds of course to the magnitude of the evil by tending to concentrate a large accumulation of refuse in one place. There is no system of drainage in Over Darwen, and very few of the houses have even the semblance of drainage. These evils were all aggravated by the overcrowded state of many of the cottages, the practice of taking lodgers being common.

When it became notorious that fever was prevailing among the inhabitants to an alarming extent, the Local Board of Health issued a notice, earnestly advising the inhabitants to whitewash and ventilate their houses, and recommending the owners of property to assist their tenants by placing lime and other disinfectants within their reach at a moderate charge. They also called attention to the bye law which provides for the employment of deodorisers during the emptying of cesspools and the removal of other offensive matters, but ample evidence was gained during the inspection that this byelaw was not of any avail, and, so far as appears, the Board had given no directions as to the mode of deodorisation or disinfection to be employed. Indeed, the hand-bill issued by the Board was quite inoperative, for the lime-washing or other purification of houses, even when deaths had occurred in them, was greatly neglected. In addition to the publication of this notice, the Board had appointed a sub-committee to inquire into the condition of the town. At a meeting of the Board, held on October 14th, this Committee presented their report, which in the main coincides with what has been here stated of the state of Over Darwen. The Board then issued numerous notices for the removal of nuisances and the execution of other sanitary works, but these had not yet been complied with at the time of the inquiry. The Board had not then taken what was evidently the best course under existing circumstances, that, namely, of removing all accumulations of refuse, lime-washing, and otherwise cleansing and disinfecting all filthy places by the agency of its own servants. Indeed, save by the publication of the hand-bill already mentioned, no effort had been made by the Board to induce the inhabitants to cleanse, and where fever had existed to disinfect, by lime-washing, or in some analogous way, the interior of their houses. One reason assigned by the Board for their apparent supineness, in the face of so formidable an epidemic, was the probability that any extraordinary expenses incurred in cleansing the town, or in the use of disinfectants, would be disallowed by the auditor. Perhaps another reason, and also an excuse to some extent, for their supineness, may be found in the circumstance, that the members of a Board, ignorant of medical matters and possessing no medical adviser, were not very competent to deal energetically and skilfully with so formidable an outbreak. Whatever the reason, it is at least quite certain that at the time when the inquiry was undertaken no appreciable means had been employed for mitigating or stopping the further progress of the epidemic.



## 3. On the FEVER at KING'S LANGLEY, by Dr. ORD.

## APPENDIX.

The inquiry was ordered to be made in consequence of representations from the Vicar and Sanitary Committee of King's Langley, to the effect that fever had recently appeared at King's Langley, that the village had in former years been visited by fever, and that it was desirable that the causes of these outbreaks should be investigated. Since the end of September about 16 cases of typhoid fever have occurred in the village, and two of the persons attacked have died. If we may judge from the number of deaths, the epidemics of past years have been more severe. Four persons died of "fever" in 1858, seven in 1857, two in 1856, and two in 1853.

King's Langley, the scene of these repeated outbreaks, is a village containing, according to the census of 1861, 963 inhabitants.

The distribution of the fever-cases in the present outbreak has been very remarkable. Eleven cases, including the two which ended fatally, occurred in the houses on the lower side of the High Street,—in eight houses out of thirty—the upper side being entirely spared. Four cases on Langley Hill, and one of a very mild type at the waterside, complete the list.

The houses in the High Street are nearly all of excellent construction, well-ventilated and clean,—far superior in themselves and their surroundings both to those on the hill, and those at the waterside.

To account for the outbreak of fever in the clean-looking High Street is more easy than to account for its absence in the other parts of the village.

At four points in the High Street,—which is about one third of a mile long,—are placed large covered cesspools, intended to receive surface water, and provided with large grated gullies for that purpose. They are simple excavations under the pathway, about three feet square and four feet deep. When opened for my inspection, two contained dirty water, with some inches of black mud beneath; one contained only black mud, about 20 inches in depth, while the fourth was filled with sewage, soft, solid, and of a most offensive character, the drains from five or six houses being led into it. Drains, opening about three feet from the bottom of these roadside cesspools, pass across the road, between or beneath the houses of the lower side, to open out at a safe distance in the fields between the High Street and the waterside; so that, unless they are rapidly filled and flushed by heavy rains, whatever flows into them remains to undergo a slower process of filtration; fluids soaking readily into the earth, solids strained off to form the mud floor. During the hot weather the stinks coming out of the gullies are said to have been so offensive that the people in houses near were obliged to keep doors and windows shut.

All drainage of the upper side of the street which is not connected with these cesspools, is effected by private cesspools carried to various depths, some even reaching the chalk. On the other hand, all drinking water is derived from wells, sunk through the gravel as far as, and to various depths in, the chalk, and walled up in many cases with uncemented bricks. Whatever water, flowing through the upper stratum or along the surface of the chalk, reaches these wells on the lower side of High Street, will have passed through the neighbourhood of cesspools, and will have incurred the danger of impregnation with organic matter.

Several rows of houses at the lower part of the village are likely to be unhealthy dwellings. In some the interior is cramped and not ven-

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I. Local inquiries as to outbreaks of typhoid fever.

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tilated; in others the air of both upper and lower rooms is tainted by stinks from privies over full and too near, from slop drains and gutters not properly flushed, from filth of various kinds allowed to accumulate in their vicinity. Want of proper repair is sometimes added to other evils, and whitewashing is in many instances urgently required. On Langley Hill are houses exhibiting similar defects, but in a less degree.

As might have been expected, King's Langley, with such unfavourable conditions in many of its dwellings, is less healthy than most country places. The annual death rate for the last ten years is 23·1 in 1,000.

The local authority for the administration of the Nuisances Removal Act is a committee of 12 persons, first formed in 1857, and employing an inspector of nuisances.

The Committee has procured the removal of much filth from the neighbourhood of houses, and appears to be anxious to act according to any advice which it may receive from you.

#### 4. On the FEVER at STEYNING, by Dr WHITLEY.

4. Steyning, by Dr. Whitley.

Steyning, with a population of 1,622 in about 280 houses, is favourably situated naturally, but great neglect, in a sanitary point of view, appears to have obtained on the part of its inhabitants. As might be expected from this, it has suffered, within the last few years, from epidemics of cholera, small-pox, scarlatina and diphtheria, which latter disease proved fatal in two cases in the same house in the early part of the present summer.

The drainage takes place into two open ditches, which skirt two of the three sides of the town, and I was told that no less than 250 of the houses drain into one or other of these ditches. In a very small number of cases, however, does such drainage include faecal matter, viz.,—in the rare instances in which water-closets exist in the houses. In the other cases, privies with cesspools are used, as many as six families, in some instances, having only one privy amongst them. These privies are frequently at the end of the garden, 20 feet or more from the cottages, but the cesspools are mostly open ones, which are emptied at uncertain intervals only, sometimes not more than once in two or three years, as may suit the convenience of the farmers.

In addition to the fact, that in many cases all the refuse of the cottages, except faecal matter, is thrown into open drains at the side of the road, several piggeries exist within the town, and are mostly very filthy. In two or three places, also, stagnant pools, in connection with the two ditches already mentioned, present a considerable surface of filth for evaporation.

Overcrowding is often met with. Thus it is not uncommon for a family of 8, 9, or even 10 persons, to sleep in two bed-rooms, the larger of which is about 10 feet square and 7 feet high. On the whole, however, the character of the cottages is rather above the average of a small country town, the flooring being good and the windows all capable of being opened.

There is an ample supply of water from deep wells, but so strongly impregnated with lime as to be little fitted for drinking purposes. Consequently, about three-fourths of the whole population use the water from one or other of the two wells at opposite ends of the High Street.



The reservoirs of these wells are very few feet below the surface, and are believed to be supplied by surface springs.

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\*The first case of the present outbreak was that of a girl, æt. 15, who, came home from service at Brighton, on the evening of April 30, 1861, having been ill at her place about a fortnight. Her mistress, whom I saw at Brighton, informed me that she had herself been attacked on Good Friday with what appears to have been typhoid fever, and that a child, æt. 4, had fallen sick April 2, but been less severely affected than the mother. I could not ascertain any source of fever for these two cases.

I. Local inquiries as to outbreaks of typhoid fever.

4. Steyning, by Dr. Whitley.

This girl was seen, on the evening of her arrival, by the Union medical officer, Mr. Young, who told me she then had well-marked typhoid fever, with much purging and bloody stools. A sister, æt. 5, slept in the same bed with her that night, and was the next person to be attacked in Steyning. The entry in Mr. Young's book shows that he did not see her professionally until May 28, but the mother stated that she had been failing for several days previous to that date.

The cottage of this family is No. 4 of a row of 32, situated in the so-called "Lanes," a road running parallel with the High Street to the westward, and forming the outskirts of Steyning in that direction. These cottages are so similar to each other, that one description will answer for all. There are two rooms on the ground floor, the larger of which is about 12 feet by 10 and 7 feet high. The flooring is good and the windows all made to open. Upstairs are two bedrooms, corresponding in size to the rooms below. The privies, of which there is here generally one for every two families, are situated at the end of the gardens, about 25 feet from the cottages, with open cesspools towards the adjoining field. A drain, for the other refuse matters, which runs close to the back of these cottages, has only been trapped since the present outbreak of fever.

The privies of these cottages, as indeed of the whole "Lanes," lie to the westward of them, so that the almost constantly prevailing westerly wind of the past summer must have carried the effluvia amongst their inhabitants. It may be well also to add here, that the cottage (Church Street) in which the fever proved most fatal, was that in which fæcal impurity had been the greatest. The privy was situated against the outer wall of the very old cottage, at a point corresponding to the fireplace of the only sitting-room and to the end of a pantry adjoining, both of which, and especially the latter, in which articles of food were kept, were described to me as being frequently highly offensive.

About 10 per cent. of the population of Steyning suffered from fever between the 30th of April and the middle of November, and in at least six or seven cases there was considerable ulceration of the throat, for which cauterization was thought desirable. In one case, Mr. Young stated that an exudation formed on the inside of the cheek much resembling diphtheria. I saw this child during convalescence, and observed a depression, the size of half a crown, on the outer surface of the same cheek.

In two only of the cases does the fever appear to have assumed any other than a typhoid type. The first of these, when seen by me, had the body covered with small spots more resembling purpura than petechiæ of typhus, and the second, whose case Mr. Young described as well-marked typhoid at the outset, had the profuse hæmorrhage from the bowels and the bleed-

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\* On careful inquiry, Steyning appeared to have been quite free from fever for some time.

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5. Yeadon, by  
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ing gums of purpura, at the date of my last visit, Nov. 9.\* In two of the fatal cases Mr. Young was convinced that perforation of the intestine had taken place.

### 5. On the FEVER at YEADON, by Dr. ORD.

Houses in Yeadon are capacious, solidly built, and well provided with windows. They are generally two-storied, the upper floor forming one large room for the looms, the lower being subdivided into dwelling and sleeping rooms; but they are singularly deficient in outdoor conveniences. The occupation of a house means often the occupation of just as much as is contained within the four walls; for many houses possess no court behind or in front, no backdoor, no privy, and no drains.

In place of a common yard behind a row of houses, there is often a back lane, communicating at each end with the street, constituting a public thoroughfare, and thereby losing the especial care and cleansing which, were it a private enclosure, it might receive. Yet along this lane is ranged what of privy, pigsty, and dirt-heap belongs to the row.

The deficiency of privies is general throughout the town. Very commonly the inhabitants of seven, eight, or more houses have to use a single privy. Such a common draught-house, filled rapidly and cleansed infrequently or imperfectly, becomes, in many instances, the subject of grave complaint.

As regards the habits of the people;—the interiors of houses are usually kept clean. From the many dwellings which have neither back doors nor sinks, slops are thrown either into open gutters or into gullies, gratings, or stone-dishes communicating with drains. The more solid refuse sometimes accompanies the slops, is sometimes thrown into the privy or ash-pit, sometimes upon a special heap placed in some convenient position by the roadside.

Through the heart of the town runs a small beck, which issues from a natural lake or tarn, situate above the town near the top of the hill. Connected with its source are the two upper or New Mills, which use the water for various purposes, and let pass into it much dye and fluid refuse. In its onward course it receives all the drains of the town, and lower down is dammed up to form the reservoir of the Old Mill. The water, now thick, black, and offensive, is pumped up into the mill, and there boiled (for purposes connected with the woollen manufacture) diffusing, as I am informed, most disgusting vapours.

The beck, where it passes near houses, is, for the most part, covered over, here and there with flags which do not fit. Its bed is left in the original rocky state, and many large openings, left as inlets for surface water and refuse, give vent to the vapours proceeding from stranded or precipitated filth. During the latter months of the summer, when long drought had nearly dried up the lake, and left little water to run down the beck, the smells are said to have been overpowering.

Several large street drains have been constructed by the local authorities. They vary in length from 150 to 400 yards, are carried deeply, are capacious, and well paved, but the numerous gullies and openings connected with them are untrapped, and, it is asserted, give vent to stinks.

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\* This girl died November 10.



There are, beside these, private drains, not always so efficient, but generally, where there are no public drains, slops are thrown into roughly paved gutters, or chance channels.

Drinking water is chiefly obtained from springs, issuing at various points from the hill side, and received into open stone troughs. A continual stream passing through the troughs washes away any dirt which is introduced, and ensures the purity of the water. One well, at the upper part of the town, in Moorfields, is subject to fouling by an adjacent leaky sewer.

Nuisances existing in the town are of several kinds.

1, Privies, and ashpits very commonly adjoin, and open towards the public ways.

2. Pigsties, manure heaps, and large urine tubs are commonly placed close to the houses and the public ways. (Urine is collected for use with pig's dung in the scouring of wool.)

3. Drains insufficient to carry off the sewage, such as a private drain at the lower end of Queen Street, or drains retaining solid filth by the unevenness of their floors, and emitting stinks through ill-fitting covers, or untrapped gullies, as in the case of the beck.

4. The regular and complete cleansing of privies, pigsties, middens, refuse heaps, gutters, and channels is, to a considerable extent, neglected; children's excrements, and other refuse, are frequently allowed to remain dotting the space before and behind houses; from many houses the slops are thrown out so carelessly that the street gullies are surrounded by a depressed black circle of mud, slops, and refuse.

Of the 4,250 persons who inhabit the town, about 130 have, since the middle of July, been attacked by typhoid fever, and 11 have died.

A few cases of ill-marked type, scattered, and, as far as evidence remains, unconnected with one another, occurred in the later weeks of July; but in the last week of August and the first week of September the disease exploded, so to speak, in all parts of the town.

As regards the circumstances under which fever appeared in houses;—1st, all the best built and best kept houses escaped. 2nd, of 59 houses, in which 98 well-marked cases of typhoid fever occurred, seven were clean and free from surrounding sources of miasm, though built like the houses around them; in all the rest one or more of the conditions above specified were noted.

It is proper to observe, that the fever appeared in a period of unusual drought, and great heat; when the sanitary arrangements of a town, ill supplied with water, would be tested to the uttermost.

The local authority for the administration of the Nuisances Removal Act is a sanitary committee of 16 members.

## APPENDIX.

I. Local inquiries as to outbreaks of typhoid fever.

5. Yeadon, by Dr. Ord.

## APPENDIX.

II. Local  
inquiries as to  
Vaccination,1. Somerset-  
shire, Devon-  
shire, Cornwall,  
and Kent.

## II. LOCAL INQUIRIES by Dr. SEATON, Dr. STEVENS, Dr. SANDERSON, and Dr. BUCHANAN, into the state of Public Vaccination in various parts of England.

## 1. DR. SEATON'S SUMMARY of the Results of his Inquiry in certain Unions in Somersetshire, Devonshire, Cornwall, and Kent.

The 37 Unions visited (enumerated in Table I.) were situated in the counties of Somerset (5), Devon (10), Cornwall (13), Kent (9), and comprised 223 vaccinating districts.

TABLE I.

Union.	Number of Vaccinating Districts in each Union.	Number of Contractors for Vac- cination in each Union.	Infantile Public Vaccinations in proportion to every 100 Registered Births.		
			Year ending Michaelmas 1858.	Year ending Michaelmas 1859.	Year ending Michaelmas 1860.
Bedminster - - -	8	7	64	45	51
Bath - - -	8	8	58	22	37
Bridgwater - - -	9	10	58	51	50
Taunton - - -	7	7	62	29	33
Wellington - - -	8	8	84	59	71
Exeter - - -	3	3	19	35	19
Okehampton - - -	5	4	14	37	21
Stoke Damerell - - -	5	5	30	29	28
East Stonehouse - - -	1	1	27	8	22
Plymouth - - -	4	5	54	38	41
Kingsbridge - - -	13	9	29	32	42
Totnes - - -	12	12	35	43	37
Tavistock - - -	8	8	56	51	86
Honiton - - -	11	11	29	24	36
Axminster - - -	10	10	55	27	36
Truro - - -	8	8	30	43	28
St. Austell - - -	6	6	—	82	65
Falmouth - - -	4	4	68	58	45
Helston - - -	5	4	34	44	28
Penzance - - -	5	5	36	71	31
Redruth - - -	5	5	42	45	31
Bodmin - - -	7	7	32	43	32
St. Columb - - -	6	6	36	58	54
Camelford - - -	3	3	44	52	47
Stratton - - -	2	2	36	45	48
Launceston - - -	7	7	41	75	63
Liskeard - - -	8	8	44	66	72
St. German's - - -	7	6	45	58	75
Thanet - - -	4	12	70	66	58
Eastry - - -	7	10	73	55	76
Dover - - -	4	4	28	18	47
Elham - - -	5	5	37	28	24
Canterbury - - -	1	1	31	30	32
Bridge - - -	6	6	44	55	73
Blean - - -	4	4	24	40	40
Faversham - - -	4	4	49	39	51
Milton - - -	3	6	41	42	88



In 34 of the unions, the vaccinating districts (210 in number) were co-terminous with the districts set out by guardians for the medical relief of the poor. In the union of Camelford, in which there were two medical districts, one of these was co-terminous with a vaccinating district; but the other was divided into two vaccinating districts. In the unions of Redruth and Stoke Damerell, the districts for vaccination (10 in number) were co-terminous with the districts for registration, and not with those for medical relief.

In 30 unions, comprising 188 districts, the union medical officers (190) were the sole public vaccinators, viz., 188 district medical officers, and the medical officers of the workhouses of Plymouth and Bridgwater, who, though not holding any medical districts, had contracts for vaccination in their respective towns.

In three unions (Thanet, Eastry, and Milton,) comprising 14 districts, contracts were made with other medical practitioners besides the union medical officers. The contracts in these unions with private practitioners considered by guardians to be in force were 14, but by three of these contractors no return of vaccinations performed had been made for more than two years.

In four unions (Liskeard, Camelford, Redruth, Stoke Damerell,) comprising 21 districts, there was a single contractor for each district: in 12 of these districts one of the Union medical officers, and in nine some other medical practitioner was contracted with.

Contracts for two districts in one union were held by the same contractor in six instances, and for three districts in one instance. Contracts for contiguous districts in adjacent unions were held by the same contractor in 14 instances.

There were thus, altogether, 217 individuals contracted with for the vaccination of the 223 districts; 196 were union medical officers, and 23 held no parochial appointment.

In 26 of the unions the public vaccinations of each contractor were limited by the guardians to the district assigned by contract; in 11 unions they were not so limited. In the latter case, however, I found that generally the number of public vaccinations performed out of the assigned district was inconsiderable; where it was not so, the arrangement appeared to be a fruitful source of jealousy.

Although I have spoken throughout of public vaccinators as "contractors," legal contracts were wanting in the following instances:—Districts 2, 3, and 5 in the Taunton union; Districts 1, 3, 4, 7, 9, 10, in the Honiton union; District 2 in the Bodmin union; District 1 in the Stratton union; Districts 3 and 5 in the Launceston union; District 8 in the Tavistock union; also in the case of one of the vaccinators in the Margate district of the Thanet union. The vaccinator of District 2 in the Bodmin union had, however, been very recently appointed, and had not yet entered upon his duties.

The payment per case of vaccinators appointed since August 1, 1853, was in no instance below the statutory minimum; in the following unions it was in excess, viz.:—In Stratton, in which 3s. per case was paid for all cases; in Thanet, Eastry, Bridge, Faversham, and Milton, in which 2s. 6d. per case was paid for all cases; and in some of the districts of Elham, in which the payment was at 2s. per case for cases under two miles from the vaccinator's residence, the statutory minimum being retained for cases beyond.

#### I.—QUANTITY OF VACCINATION.

In inquiring into the quantity of vaccination in the respective unions, I followed the same plan of investigation as was stated in my Report of Unions inspected in 1860.

#### APPENDIX.

##### II. Local inquiries as to Vaccination.

1. Somersetshire, Devonshire, Cornwall, and Kent.



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II. Local  
inquiries as to  
Vaccination.1. Somerset-  
shire, Devon-  
shire, Cornwall,  
and Kent.

The general result arrived at was this, that the quantity of vaccination, and especially of infantile vaccination, was very defective. The intentions of the legislature with regard to the vaccination of children within three or four months of birth were so far from having been fulfilled, that more than one-third part of all the primary vaccinations which had been performed by the public vaccinators in the three years 1858–60 inclusive, had not been performed till the children had attained the age of *more than one year\**; a considerable portion not till they had attained the age of two, three, four, or even several years.

On personal inquiry into the state, as to vaccination, of 19,075 children in national and other charitable schools, and in workhouses, I found that 14·0 per cent. had never been effectively vaccinated, and that 10·6 per cent. were, on the days of inspection, without any protection whatever against smallpox. The difference between “unvaccinated” and “unprotected” was of course due to the number of children who, in consequence of the neglect of vaccination, had already suffered from smallpox. Of the younger portion of the children examined, viz., those in infant schools, 17·3 per cent. had never had effective vaccination, and 14·5 per cent. were wholly unprotected.

Neglect of infantile vaccination was found to exist, more or less, in every union, and generally to have extended to every district. But the amount of neglect varied exceedingly.

This variation was much more observable on comparison of districts, than on comparison of unions; and this because the systematic maintenance of vaccination in any place had always depended much more on local influence and exertions, especially on the part of the vaccinators and registrars, than on any supervision of, or exercise of authority by, Boards of guardians, who, in fact, had seldom actively interfered, except at times of presence or proximity of smallpox. Hence it was not unusual to find in the same union specimens of the best-vaccinated, and of the worst-vaccinated, districts. Such examples were seen in the unions of Wellington, Launceston, Camelford, Liskeard, &c.

Although I found no district in which the expressed object of the Legislature, that all children, whose health permitted, should be vaccinated within three, or, at most, four months from birth had been attained, there were several districts in which great attention had been given to securing the vaccination of children in very early infancy, and with most satisfactory results. In the district of Mevagissey, in the Union of St. Austell,—a district of 4,945 inhabitants,—nearly all the

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\* The total successful public vaccinations in the 37 unions had been 75,635, of which 44,739 had been of children under one year of age, and 30,896 of children and persons above that age. But from the latter, deduction had to be made on account of revaccinations.

In most of the unions, no re-vaccinations were included in the public Returns. The contract had been construed to apply to primary vaccinations only, and the re-vaccinations (if any) had not been charged to the union. In other unions, successful re-vaccinations had been charged, even when they had been performed below the limit of age at which re-vaccination is now authorized under the Instructions.

As no distinction between primary and secondary vaccinations had been made by the vaccinators in entering the cases in their registers, I was only able to make an estimate founded on general statements and on examination of the registers as to ages, of the amount to be deducted from the respective returns on account of re-vaccinations. But it was very certain that the deduction of 20 per cent. from the entire number of vaccinations returned as having been performed above one year of age, which I have allowed in making the statement in the text, was largely in excess. As the practice of public re-vaccination is becoming, under the Instructions, more extended, it is of extreme importance that the distinction of these cases from primary vaccinations, which is required by the regulations, should always be observed in the registers, and that a similar distinction should be made on the public Returns.



children born were vaccinated within six or seven months of birth : the register of the public vaccinator showed that of 296 public vaccinations performed in 1859 and 1860, only 17 had been in children above the age of one year, these having all been cases either of children born out of the district, or of children whose vaccination had been postponed by the vaccinator himself. The register of the District-Registrar gave an all but complete account of all the children who had been born in the district since the enactment of the compulsory law. On 485 entries of children in his last completed book (from January 1, 1857, to July 27, 1860), it appeared that the certificate of successful vaccination had been registered in 443 cases, and a note made of death or departure from the district in 33 cases. Only nine children were unaccounted for on the register, regarding some of whom it was known that vaccination had been performed by a private practitioner who had not forwarded certificates, and regarding the rest that the vaccination had been postponed by the public vaccinator himself. I am not able to give, from the "Registers of Successful Vaccinations" kept by registrars, the same complete account of other districts, in which I had every reason to be assured that the general state of infantile vaccination was very satisfactory. In District 5 of the Launceston union, and District 7 of the Liskeard union, both held by the same public vaccinator, nearly all the vaccinations of children born in the district were performed within a very few months of birth ; the number vaccinated annually, compared with the annual number of births, attested the sufficient amount of vaccination ; and the regularity with which the work had been carried on was shown by the returns of vaccinations for successive years, viz., for five successive years in the former district, 101, 106, 108, 102, 101 respectively, and for three successive years in the latter (an increasing mining district), 232, 242, 264 respectively. In District 6 of the St. Columb union, in the Boscastle district of the Camelford union, in the Margate and Minster districts of the Thanet union, in districts in the Eastry and Bridge unions, in all which the returns of public vaccinations gave no reasonable presumption of insufficiency, nearly all the vaccinations had been performed within one year, and generally within a few months of birth. And in several other districts, in which vaccination was very regularly maintained, though the efforts to secure early vaccination had been less completely successful, there was a very large relative amount of infantile vaccination. Such were Districts 4 and 5 in the Bedminster union ; the Tavistock and Calstock districts in the Tavistock union ; Districts 6, 7, and 8 in Wellington union ; the St. Keverne district in the Helston union, and several others.

But even this degree of sufficiency was attained in comparatively few of the districts inspected ; and in at least 185 out of the 223 districts, the deficiency of infantile vaccination was considerable.

In a few rural districts, in which the work of vaccination was carried on regularly by the vaccinator, and there was no indisposition to vaccination on the part of the people, this defect of infantile vaccination appeared to arise simply from a want of due recognition, either by vaccinator or people, of the necessity for the *early* performance of the operation. In such districts, of which St. Germans, No. 1, was a specimen, children who were not vaccinated when young babies were, at all events, vaccinated soon after they were a year old, and there was no accumulation of arrears.

But this was exceptional, and usually wherever vaccination in early infancy was neglected, its performance was indefinitely postponed, and accumulations of arrears took place. In some districts, as at Plymouth

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and Devonport, the practice of vaccination was maintained regularly, but in insufficient quantity; in other districts, far more numerous, it was carried on fitfully and irregularly, and often it was suspended for long periods together. I met with districts in which there had been no vaccination, or a merely nominal amount of vaccination, for periods of two years and more at a time; one district (of above a thousand inhabitants) in which there had been but a single vaccination for more than five years.

In the accompanying Tables (II. and II a.) are exhibited various examples of this irregularity:—

TABLE II.

Showing the Public Vaccinations for Three Years in certain Vaccinating Districts, with the Population of each District.

Union and District.	Popula- tion 1851.	Infantile Vaccinations.			Vaccinations above One.		
		1858.	1859.	1860.	1858.	1859.	1860.
Bath - - - - 1-4	54,008	681	188	449	465	43	221
Bedminster - - 6	2,063	28	19	15	123	8	13
Bridgwater - - 9	4,460	69	4	54	200	—	36
Wellington - - 4	2,409	79	—	—	252	—	—
„ - - - - 5	2,409	44	5	9	104	12	11
Okehampton - - 2	5,762	3	20	8	18	174	23
„ - - - - 3	4,628	33	33	31	79	105	56
„ - - - - 4	6,654	16	127	32	6	699	10
Kingsbridge - - 1	707	—	—	19	—	—	28
„ - - - - 2	1,360	—	30	3	—	62	5
„ - - - - 3	4,692	—	17	5	—	67	32
„ - - - - 4	2,600	5	30	2	—	19	—
Honiton - - - 1	5,114	47	3	19	135	12	143
„ - - - - 2	756	9	3	—	43	—	—
„ - - - - 6	5,758	27	18	37	21	15	262
„ - - - - 7	1,017	1	—	—	1	—	—
„ - - - - 9	1,042	8	7	15	55	13	11
Axminster - - 2	3,009	22	53	18	56	175	40
„ - - - - 6	2,875	52	2	—	227	—	—
„ - - - - 7	3,878	32	5	8	259	1	2
„ - - - - 8	2,883	25	21	12	147	53	10
Camelford - - -1 & 2	5,793	31	60	43	49	131	54
Truro - - - St. Mary's	7,998	15	35	11	2	32	14
Dover - - - St. Mary's	10,311	27	32	*	19	5	*
Elham - - - Hythe	5,254	—	7	18	—	10	35
Blean - - - Herne Bay	4,886	8	34	33	3	44	29

\* Incorporated with another district in 1860.

The returns in my possession for the foregoing districts have not enabled me to give the average annual births in each. In the following examples this information was supplied:



TABLE II *a*.

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Showing the Public Vaccinations for Three Years in certain Vaccinating Districts, with the average Annual Births in each District.

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Union and District.	Annual Births. Average of Three Years.	Infantile Vaccinations.			Vaccinations above One.		
		1858.	1859.	1860.	1858.	1859.	1860.
Totnes - - - 8	28	—	—	7	—	—	26
" - - - 9	63	18	—	—	48	—	—
" - - - 10	139	29	44	30	53	224	68
" - - - 12	42	3	30	1	4	154	2
Penzance - - - 4	373	79	277	46	70	181	20
Redruth - - - 1	472	108	116	57	177	118	6
Bodmin - - - 3	168	20	61	22	15	112	13
" - - - 6	141	18	54	26	9	163	33

The examples above given comprise every variety of district : scattered rural populations ; small towns, as Kingsbridge, Honiton, Sidmouth, Lyme Regis, Hythe ; towns of larger size, as Truro, Dover ; the great city of Bath, the most populous (with the exception of Plymouth and Devonport) of all the places I visited. And it would be easy to add further examples of each class of district.

The accumulations of unvaccinated, which took place under such circumstances, were necessarily very considerable ; and on examining the condition of a number of children in schools (all, it must be remembered, above two years of age,) it was not unusual to find that 20 per cent., and of the younger children 30 per cent. and upwards, had not been vaccinated. The results of school examinations in some of the defective districts are shown in the following Tables :—

TABLE III.

Showing the Results of Examination of Children in the various National, British, and Infant Schools of certain Districts.

Union	Part of Union in which Schools were situate.	Number of Schools inspected.	Number of Children examined.	Number unprotected by Vaccination.	Of whom had already had Smallpox	Per cent. of Children examined unprotected by Vaccination.	Per cent. of Children examined wholly unprotected on Day of Inspection.
Bath - -	City - -	4	630	95	36	15	9.3
Exeter - -	City - -	5	844	158	60	18	11
Taunton - -	Taunton - -	2	211	38	16	18	10
Okehampton - -	Okehampton - -	2	116	28	1	24	23
Stoke Damerell - -	Devonport and Keyham.	6	735	83	41	11	5.6
Plymouth - -	Plymouth - -	5	565	74	40	13	6
Totnes - -	Ugborough - -	1	95	26	7	27	20
" - -	Brixham - -	3	262	65	26	24	14
" - -	Dartmouth - -	3	139	41	12	29	20
Honiton - -	Sidmouth - -	5	265	89	7	33	30
Axminster - -	Seaton - -	4	188	44	—	23	23
" - -	Lyme Regis - -	3	177	48	9	27	20
Truro - -	Truro - -	6	402	69	13	17	13
" - -	St. Agnes - -	1	53	15	2	28	24
Penzance - -	Penzance - -	3	348	69	20	20	14
" - -	Marazion - -	1	60	16	—	26	26
Redruth - -	Redruth - -	1	207	40	12	19	13
Thanet - -	Ramsgate - -	2	162	37	10	22	16
Dover - -	Dover - -	9	600	125	43	20	13
Faversham - -	Faversham - -	3	618	100	17	16	13

TABLE IV.

Showing the Results of Examination of Children in the Infant Schools and Baby Classes only, in certain Districts.

Union.	Part of Union in which Schools were situate.	Number of Children examined.	Number unprotected by Vaccination.	Of whom had already had Smallpox	Per cent. of Children examined unprotected by Vaccination.	Per cent. of Children examined wholly unprotected on Day of Inspection.
A. Infant Schools :						
Taunton -	Taunton -	73	17	3	23	19
Exeter -	City -	273	71	22	26	18
Okehampton -	Okehampton -	48	14	1	29	27
Stoke Damerell -	Devonport -	298	44	15	14	9
Plymouth -	Plymouth -	301	36	12	12	8
Totnes -	Brixham -	99	34	11	34	23
Honiton -	Sidmouth -	48	18	—	37	37
Axminster -	Seaton -	95	27	—	28	28
„ -	Lyme Regis -	53	22	3	41	36
Dover -	Dover -	157	42	7	26	22
Elham -	Hythe -	102	21	2	20	18
„ -	Folkestone -	76	24	—	31	31
Canterbury -	City -	181	43	—	23	23
Faversham -	Faversham -	233	41	—	17	17
B. Baby Classes :						
Exeter -	City -	58	23	2	39	36
Bath -	City -	80	31	3	38	35
Axminster -	Lyme Regis -	12	10	—	83	83

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In a large number of other schools there were similar evidences of neglect. A considerable number also of those children in the schools who were found protected by vaccination had not received their protection in infancy, but at some period which had usually depended on the occurrence of smallpox, or the existence of alarm of smallpox, in the district. In districts in which smallpox had recently prevailed, or was actually present at the time of my inspection, there were found many children in the schools with recent marks of vaccination, or actually going through the vaccine process. In the parochial school of St. Mary's, Truro, *e.g.*, 14 per cent. of the children had only recently been vaccinated; and in several districts, under similar circumstances, the actual per-centage of unvaccinated in schools was comparatively small, simply because of the amount of *recent* vaccination.

From the rapidity with which, where neglect of infantile vaccination exists, accumulation takes place in large towns, and the frequency with which these are therefore visited by epidemics of smallpox, the proportion of *elder* children who remained unvaccinated, or had not already suffered the consequences of neglect, in such towns was comparatively small, and the accumulation of unprotected was almost entirely of younger children. Thus, in Bath, 5 per cent. of the elder children, 35 per cent. of the younger; in Exeter, 8 per cent. of the elder, 36 per cent. of the younger children were unprotected. In country towns, on the other hand, and rural districts, which sometimes remain for long periods without any visitation of smallpox, a large proportion among elder children (*e.g.* 18 per cent. in Seaton, 20 per cent. in Okehampton, 29 per cent. in Sidmouth,) were found unprotected; and there had even been, in some districts, a considerable number of unprotected adolescents and adults. Recent epidemics in some of the unions in Devonshire and Cornwall had



induced many of the latter, who had heretofore refused vaccination, to seek for it. The statements made to me by the medical men, with regard to the previous non-protection in these cases, were very precise and positive; and I was able, in several instances, to confirm these statements by personal examination.

I inquired into the vaccination of children in workhouses, and the performance of the duty devolving upon the medical officer of the workhouse, under Art. 207, No. 5. of the Consolidated Order of the Poor Law Commissioners of July 24, 1847, "to vaccinate such of the children as may require vaccination." The result of the inquiry for each workhouse is shown in Table V. :—

TABLE V.

Showing the Results of the Examination of Children in Workhouses.\*

Union.	Number of Children examined.	Number without trace of Vaccination.	Number with doubtful trace of Vaccination.	Number of those unvaccinated, or doubtfully vaccinated, who had Marks of Smallpox.	Per cent. of Children examined unprotected by Vaccination.	Per cent. wholly unprotected on Day of Inspection.
Bedminster - -	89	12	2	2	15.7	13.4
Bath - - -	190	16	—	12	8.4	2.1
Taunton - - -	69	7	—	2	10.1	7.2
Wellington - -	45	5	1	—	13.3	13.3
Exeter - - -	43	7	2	2	20.9	16.2
Okehampton - -	41	1	1	—	4.8	4.8
Stoke Damerell -	98	13	2	6	15.3	9.1
East Stonehouse	11	5	—	4	—	—
Plymouth - - -	137	37	4	5	29.9	26.2
Kingsbridge - -	44	10	3	3	29.5	22.7
Totnes - - -	52	10	—	9	19.2	1.9
Tavistock - - -	51	7	—	—	13.7	13.7
Honiton - - -	47	14	1	—	34.0	34.0
Axminster - - -	57	10	—	1	17.5	15.7
Truro - - -	90	5	1	2	6.6	4.4
St. Austell - -	59	1	1	—	3.3	3.3
Falmouth - - -	40	2	2	—	10.0	10.0
Helston - - -	62	13	—	5	20.9	12.9
Penzance - - -	34	19	—	3	55.8	47.0
Redruth - - -	117	39	2	16	35.0	21.3
Bodmin - - -	43	5	—	—	11.6	11.6
St. Colomb - -	35	1	2	—	8.5	8.5
Camelford - - -	27	3	1	—	14.8	14.8
Stratton - - -	7	—	—	—	—	—
Launceston - -	36	4	—	1	11.1	8.2
Liskeard - - -	55	10	—	4	18.1	10.9
St. Germans - -	21	1	—	—	4.7	4.7
Thanet - - -	99	12	—	1	12.1	11.1
Dover - - -	73	11	1	4	16.4	10.9
Elham - - -	65	5	2	4	10.7	4.6
Canterbury - -	23	7	1	6	34.7	8.6
Bridge - - -	47	3	2	—	10.6	10.6
Blean - - -	36	6	1	—	19.4	19.4
Faversham - -	84	11	1	2	14.2	11.9
Milton - - -	34	5	0	—	14.7	14.7

\* Children under the age at which non-vaccination becomes illegal have not been included in this Table.

Circumstances prevented examination of the Children in the Bridgwater and Eassey workhouses.

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In many of the unions this duty appeared to have been regularly discharged, and the cases found unvaccinated were either children whose vaccination had been postponed, or children recently admitted. But in many unions there had been much irregularity and neglect. This was especially observable in Penzance, Redruth, Honiton, and Plymouth. In Penzance workhouse nearly half the children were unprotected, several of whom had been born in the house, and several had been inmates for years. In Honiton workhouse one-third, in Plymouth workhouse more than one-fourth, of the children were unprotected. In Redruth workhouse the previous neglect had been much greater than appears in the table, inasmuch as a considerable number of children (15), most of them neither recently born nor recently admitted, were under vaccination on the day of inspection. In Totnes, Helston, and Elham workhouses cases of smallpox had within a recent period occurred in children unprotected by vaccination. In Totnes there had been several such cases in the spring of 1861; many of the children had been long inmates; the attempt to vaccinate them was made after the introduction of smallpox into the workhouse, but too late. In Helston I saw several (unvaccinated) children marked with smallpox, which they had contracted in the house about a year and a half before my inquiry. In Elham House, about three months before this inspection, smallpox had attacked five unvaccinated children, all of whom had been for some months in the house, and one of them had died. There were other children also in the house at the time, unvaccinated; but these, being at once vaccinated, were saved.

The cases of neglect discovered in workhouses had not, in a large number of instances, *originated* in the house, but were in children born elsewhere. But as all children must be examined on admission by the medical officer, there had always been an opportunity of ascertaining with regard to such children the fact of successful vaccination. It is of great consequence that advantage should invariably be taken of this opportunity, and that no time should be lost in repairing any neglect ascertained to exist. The floating population of workhouses is of a class who are very likely to have overlooked the vaccination of their children. I am of opinion that in some cases the workhouse vaccinations would have been less insufficiently performed, if the rule had prevailed (which in some other cases does prevail) of paying per case for workhouse vaccination, as vaccination out of the workhouse is paid for.

Many of the unions visited had, in consequence of the neglect of vaccination above described, suffered severely from smallpox. The mortality from this disease in each of the unions, for the three years 1858–1860 inclusive, is shown in the accompanying Table (Table VI.): and there had, during 1861, been outbreaks at Spaxton in the Bridgewater union, at Taunton, at Exeter, at Plymouth, in various parts of the unions of Kingsbridge, Totnes, Tavistock, Truro, St. Austell, St. Columb, Liskeard, St. Germans: also one, limited to the workhouse, in Elham.



TABLE VI.

Showing the Mortality from Smallpox in the Inspected Unions  
in Three Years, 1858-60.

Union.	Deaths from Smallpox.			Union.	Deaths from Smallpox.		
	1858.	1859.	1860.		1858.	1859.	1860.
Bedminster -	49	—	—	Penzance -	—	13	2
Bath -	148	2	6	Redruth -	16	56	4
Bridgwater -	3	36	—	Bodmin -	—	2	—
Taunton -	72	5	—	St. Colomb -	3	—	1
Wellington -	12	10	—	Camelford -	—	—	—
Exeter -	—	43	4	Stratton -	—	3	4
Okehampton -	5	17	1	Launceston -	3	6	2
Stoke Damerell -	3	37	57	St. Germans -	—	4	3
East Stonehouse -	7	7	24	Liskeard -	—	4	2
Plymouth -	51	16	63	Thanet -	3	2	—
Kingsbridge -	—	5	5	Eastry -	23	1	—
Totnes -	5	15	5	Dover -	1	—	10
Tavistock -	2	5	9	Elham -	—	—	2
Honiton -	3	1	3	Canterbury -	2	—	1
Axminster -	15	4	1	Bridge -	—	1	—
Truro -	—	10	—	Blean -	3	—	—
St. Austell -	—	—	—	Faversham -	3	—	1
Falmouth -	10	12	—	Milton -	—	—	—
Helston -	4	16	—				

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No place had suffered so severely as Bath. An epidemic commenced there towards the end of 1857. In 1858 there died, in the five registration districts of the union within which the city is comprised, no fewer than 142 individuals, of whom 119 were quite young children, eight adolescents or adults of whom it was recorded on the registers that they had *not* been vaccinated, six adults who were *said* to have been vaccinated,\* and nine adults or adolescents regarding whose vaccination there was no information. This mortality was, proportionally, more than sixfold the mortality which created so much alarm in London, at the time that smallpox was epidemic there in 1859. The *cases* of smallpox which occurred in Bath during the continuance of the epidemic amounted to many hundreds. The previous neglect of vaccination had been great, and no special measures were adopted by the authorities to repair the consequences. The guardians, indeed, fearful of creating alarm, did not even put out a warning notice. The amount of vaccination, therefore, during the epidemic, though considerable, was very inadequate; and no sooner was the epidemic at an end, than the rate of infantile vaccination declined. From 58 per cent. of the registered births (the rate in 1858), it became 22 per cent. in 1859, and 37 per cent. in 1860; and already, at the time of my inquiry, materials for a fresh outbreak had accumulated among the younger children, no fewer than 35 per cent. of those in the baby classes in the infant schools being unprotected.

The case of Taunton was similar. When smallpox appeared in the town and union in 1858 there existed an enormous accumulation of

\* In one of these cases the vaccination was *known* not to have gone through the regular course.

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unvaccinated children at every age, as well as many adolescents and young adults. The activity with which vaccination was then carried on was insufficient to overtake the disease, and 72 deaths were recorded. When the disease ceased, a re-accumulation of unvaccinated cases at once began. I found a large proportion of the youngest children in the schools unprotected; and although scarcely three years had elapsed since the outbreak above alluded to, smallpox was again beginning to manifest itself. It had commenced about a month before the date of my inquiry. I had information of 14 cases at the least, of which nine had been in young unvaccinated children. Three of these children had died, and in four the event was yet undetermined.

The mortality in the Wellington union had been chiefly in the town of Wellington, in which there had been, and was still, considerable neglect of vaccination. The districts of this union to which I have before adverted (p. 3) as comparatively well vaccinated, did not suffer; and, though the disease was *imported* into one of them several times, it did not spread. The authorities in this union had not adopted any special measures for the arrest of the disease.

In Bridgwater, in 1859, after the disease had made some progress, the registrar of the town, at the desire of the guardians, made a census of vaccination. He found some hundreds of children avowedly unvaccinated. A few summonses were issued to persons who refused to have their children vaccinated, and convictions were obtained. Great attention was then given by the people to vaccination, with the effect, after a time, of arresting the disease. In consequence of the amount of vaccination then effected, I found very few children in the schools at Bridgwater unprotected, but it was the opinion of the registrar that, among children more recently born, there was a considerable amount of neglect.

In Exeter there had been a very severe epidemic in 1859. Vaccination had since been greatly neglected; of the youngest children in the schools, I found 36 per cent. unprotected. A fresh epidemic had commenced about two months before the date of my visit, and was extending.

Again, in Lyme Regis, in the Axminster union, where the disease had been very severe and fatal in 1858, 36 per cent. of children in the infant school at the time of inspection were unprotected.

In Plymouth, in which smallpox had been very fatal in 1858 and the early part of 1859, the disease had reappeared in an epidemic form in 1860. There had been in that year 63 fatal cases. In 1861, there were in St. Andrew's registration district alone 27 more deaths up to May 10: all the deaths in this district, from September 1860 to May 1861, had been, with five exceptions, in young children. In one of the medical districts there had been 80 cases in parochial practice from June 1860 to June 1861; 39 of these being in vaccinated individuals, of whom none died, and 41 in unvaccinated persons or children, of whom nine died. A great number of children had been found unvaccinated in the houses and rooms in which were cases of smallpox.

The mortality in Devonport and East Stonehouse had not been less severe, and occurred under the same circumstances as to neglect of vaccination.\*

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\* Districts in other Unions, and especially the country districts in Devonshire, were originally responsible for a great deal of the neglect which produced its consequences in these three towns.



It is not necessary to continue these details. All the epidemics of smallpox which had occurred, and all the high mortality exhibited in the Table (as in Redruth union, *e. g.*, in which the deaths from smallpox exceeded those that had been caused by epidemic cholera,) were ascertained to have arisen under precisely the same circumstances, viz., great previous neglect of vaccination. I will therefore limit my remaining observations on this head to the unions in which, as in Taunton and Exeter already referred to, smallpox epidemics were proceeding at the time of my inspection.

The severest outbreak was at Truro ; and chiefly in the district of St. Mary and St. Clement. It had commenced in March 1861, had been fatal in four cases in April, in six in May, and was making rapid extension at the period of my inquiry (June 22.) There had been most scandalous neglect of public vaccination in this district. It is a district of above 8,000 inhabitants, and the public infantile vaccinations for the four successive years, 1857-60, had been 8, 15, 35, and 11 respectively ; the entire public vaccinations at all ages for the same period had been only 14, 17, 67, and 25 respectively, these numbers including all vaccinations in the workhouse, which is situate in this district. Since the outbreak of smallpox, a large amount of vaccination had of course been effected, but a large proportion of children were still unprotected. Some little time before my inquiry the disease had extended into the adjacent districts of East Kenwyn, and of West Kenwyn and Kea, in which the state of public vaccination, though not satisfactory, was very different indeed from that above described.

The guardians had been in constant correspondence with their medical officers on the progress of the disease, but at the time of my inquiry they had not taken any special proceedings in furtherance of vaccination. The measures which, after investigation, I felt it my duty to recommend, were immediately adopted ; and, by communications received from the registrars at the end of August, it appeared that the fatality of the disease had been remarkably checked. Of the whole number of deaths which had taken place from the commencement of the outbreak (30), only five had occurred after the date at which it was possible for these measures to have produced effect.

An outbreak in the union of St. Austell, which had commenced about four months previously, and had been the subject of communication between their Lordships and the Guardians, had been met by a very large amount of vaccination, and was, at the period of my visit, apparently coming to an end. The cases had been numerous, and nine had been fatal ; only four of these, however, were in young children ; three were adults, known not to have been vaccinated ; two adults, whose vaccination was doubtful. Although the general state of vaccination in this union was far from having been so complete as that of one of its districts (Mevagissey) before remarked upon, it was very much more satisfactory than that of many unions which I have visited.

An outbreak in the union of Liskeard, which had also been the subject of communication from their Lordships, had been vigorously dealt with and appeared to have ceased. The antecedent state of vaccination in this union had been far from satisfactory ; but in 1859 and 1860 a large amount of vaccination had been effected, and during 1861 active measures had been taken under direction of the guardians for the promotion of vaccination. These measures had been very successful ; and though the cases of smallpox, which had occurred during the epidemic which was subsiding, had been numerous, and six had been fatal, only two of the deaths had occurred in children born since the enactment of the compulsory law.

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The principal causes of the defective amount of infantile vaccination, which I have described, appeared to me to have been, on the one hand, the existence of prejudice and apathy in parents; on the other hand, defective arrangements, and the absence of provision for carrying out in a regular and systematic way the powers of the law.

*Prejudice and apathy.*—In every place I visited I made inquiry as to the feelings of the people respecting vaccination. More or less of indifference, and of a desire to procrastinate, seemed to exist almost everywhere; but, except in certain districts, which were comparatively not numerous, actual objection to vaccination appeared to have been limited altogether to individuals, and to have had no material influence on the general result. The districts in which objection had had a more extended influence were situated in the South-western counties; and, in nearly all of them, there was the most gratifying evidence of a great change of feeling having recently taken place in this respect. In districts particularly in the Kingsbridge, Totnes, and Tavistock unions, and in the St. Austell and Truro unions, there was this evidence. Parents who had had their younger children (born since August 1, 1853,) vaccinated in compliance with the law, but had declined to have their elder children vaccinated, had lately, on the occurrence of smallpox, brought them for this purpose with anxiety; and this feeling with regard to their children, as well as that of grown-up persons with regard to themselves, was contrasted by the medical men with what they had observed on previous outbreaks, when all the anxiety of the people had been for “the real thing.” Registrars, again, noticed to me the great change which had taken place in the manner in which the notice paper regarding vaccination was received. One of the registrars of Exeter informed me that at one time the people would insult him, but that now they always took the paper readily, and said they “would see to it.” This change had taken place within the last 18 months or 2 years.

It was apathy, however, which, so far as the people were concerned, had been the influential cause of the omission or postponement of vaccination. In numerous instances this had been so great that even the close proximity of danger had been quite insufficient, without the exercise of external influence, to rouse the people to a sense of their duty. On the other hand, much of the omission appeared to have resulted mainly from ignorance of the extent of risk run by delay.

In many cases vaccination had been omitted or postponed, not because the parents objected to vaccination or were indifferent about it, but because they objected to the way in which it was offered to them, and preferred to wait till they could have their children done from the arms of others.

2. *Defective arrangements.*—A very large share of the neglect of infantile vaccination which existed appeared to me to have been due to this cause; and, especially, to the want of regular and systematic opportunities for vaccination in the way in which parents are always desirous of having their children vaccinated,—the only way, in fact, in which many of them will accept vaccination,—viz., direct from the arms of other children. The plans of vaccination laid down in the respective contracts appeared to have been conceived, in most instances, without reference to all that was necessary to secure this cardinal point. They were, indeed, in a very large proportion of cases, such as, if observed, would have rendered vaccination in this way totally impossible. On this and other accounts they had, in the great majority of districts inspected, ceased to be observed; and very



frequently no regular and systematic plan of any kind had been substituted for them. There was evidence, with regard to districts, and portions of districts, which remained unvaccinated for a year and more at a time, that no serious attempt had been made by the vaccinator to vaccinate them. And with regard to many other districts, the vaccination of which was much in arrear, the testimony of registrars, relieving officers, and others was, that the fault had been quite as much that of the vaccinator as of the people; numerous instances being cited to me of people waiting both for vaccination and inspection (and this not once, by chance, but time after time,) without any vaccinator making his appearance. The registrar of one district had, a few months before my inquiry, made it his duty to attend personally at various stations in his district, with the view of ascertaining this point, and had attended one station several times. He never saw a vaccinator on a single occasion, but on every occasion, except one, there were children present to be vaccinated. And I met with more than one instance in which parents had been summoned for the non-vaccination of their children, and the magistrates, anxious to see the law observed, had yet felt they could not justly inflict the penalty because it was proved that the appointments of the vaccinator were not observed.

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There was abundant other proof of the large extent to which the vaccination of districts depended on the suitableness of arrangements, and the punctuality with which these were observed. A change of vaccinator would alter speedily the state of vaccination of a district. In the town of Hythe, *e.g.* (Table II.) there had been no public vaccination in 1858, and a merely nominal amount in 1859 and the early part of 1860. A new vaccinator was then appointed, and at the time of my inquiry vaccination was going on regularly in the district. In another district in the same union, in which there had been also great neglect, a similar improvement had also taken place in consequence of the change of vaccinator. I met with many other such instances. A private practitioner in Cornwall told me that people living in a particular district near the town in which he resided used to come to him in considerable numbers, and pay him a fee for vaccinating, because they could not get hold of the public vaccinator. A year or two ago the vaccinator had been changed, and this source of income had from that time ceased.

This non-observance of vaccination from unsuitable arrangements was not by any means limited to rural districts and to attendances contracted for at stations distant from the vaccinator's residence. In no class of districts, and no parts of districts, on the whole, have I found vaccination more defective than in small or moderate-sized towns and villages in which the vaccinator resided, and where the attendance contracted for was at his own residence. The attendance in these instances required by the contracts was almost always at the least once in the week. But the number of births rendered it simply impossible to maintain weekly vaccination from the arm, and by any observance of this plan applicants would in considerable proportion have to be vaccinated, if at all, with dry lymph. Very frequently, however, there was no lymph, wet or dry, fit for use at hand; and vaccinators in such districts have very generally told me that, except at times of their own selecting and arrangement, they would be unable, as a rule, to vaccinate any one brought to them according to the notices given.

From subdivision of districts, and an ill-contrived scheme of attendances, the same evil was found to exist even in some of the



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very largest towns : and, regarding the unions inspected generally, it may be said that the appointments which were made by contracts for vaccination at vaccinators' residences, were, in the very great majority of instances, as much fictitious appointments (although the contractor might individually be present at the time and place specified) as those made for distant stations, at which no attendance at all was given.

3. *The absence of provision for carrying out in a regular and systematic way the powers of the law.*—In several of the districts visited, proceedings had at some time or another been instituted for carrying into effect the provisions of the law, viz. in the unions of Bridgwater, Kingsbridge, Tavistock, Redruth, Penzance, Bodmin, Launceston, Liskeard, St. Austell, Milton; but in the great majority of instances they had only been undertaken at times of presence or alarm of smallpox; and, with the exception of the year during which the subsequently repealed eighth clause of the "Public Health Act, 1858," was in force, they had been taken at the risk, as to costs, of the persons instituting them. Loss had in some cases ensued, and it was not likely, under these circumstances, that similar proceedings would have been taken again. The persons taking proceedings had been generally registrars, acting either by direction of guardians or with their sanction and advice, or clerks to guardians. In some cases vaccinators, or registrars, had undertaken proceedings on their own responsibility.

These proceedings, when instituted, had, in every instance brought to my notice except one, led to the vaccination of the child respecting whom the proceedings were taken, and, in every instance without exception, to a marked temporary impulse to the vaccination of the district. It appeared to be the opinion of all engaged in the local administration of the vaccination laws, that if such proceedings were regularly followed up, the difficulties with regard to the vaccination of the people would soon cease. As soon, indeed, as the public mind was impressed by the belief that the provisions of the law would be enforced, it was conceived that actual proceedings would very seldom be called for. In some of the districts which I have enumerated as the best vaccinated, the registrars and vaccinators informed me that, without the compulsory law, they would have been quite unable to produce the results attained, but that they had never had occasion to take actual proceedings. It had been sufficient that the people knew they were in earnest, and that neglect would certainly lead to proceedings.

The change in the law effected last session (24 & 25 Vict. c. 59.) has removed the difficulties above referred to in respect of costs; and guardians have now the power of prosecuting at the public expense all cases of neglect. My experience leads me to believe that boards will generally be willing to exercise this power at periods of alarm from smallpox, and that very great benefit will result from this at such times in the rapid clearance of arrears. The comparatively small mortality in districts of the Liskeard union, in which there had been considerable previous neglect, had been due (as before stated) to the active steps taken for carrying the law into effect.

But it is not the clearance, but the prevention of arrears, which is indispensable for putting an end to our frequent visitations of fatal smallpox; and for this purpose it is requisite that the law should be regularly and systematically carried out. The most effectual provision for doing this would be, it appears to me, the appointment of some person in each union for the purpose of examining, at stated times, the



“register of successful vaccinations,” and warning defaulters, as well as of taking actual legal proceedings where such were required. I had reason to think that some Boards of Guardians would have adopted this plan if existing statutes had enabled them to pay a reasonable remuneration to the person undertaking this duty.

I met, in a few districts, with registrars who had voluntarily taken the course described ; they examined their registers from time to time, made lists of defaulters, and took some opportunity of warning them. The result was eminently satisfactory, and convinced me that the practice had only to be extended, and to be made in each district the duty of an appointed officer, to ensure a very complete working of the Act of 1853.

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1. Somersetshire, Devonshire. Cornwall, and Kent.

## II.—QUALITY OF VACCINATION.

In order to ascertain the quality of vaccination which had been current in the respective unions, I examined carefully the arms of 17,055 children in various national, parochial, and other charitable schools, and of 2,020 children in workhouses.

In 2,688 of these 19,075 children, there were no marks of effective vaccination ; 107 had the vaccine crusts on their arms, or were in some stage of vaccination. The quantity and number of vaccine marks in the remaining 16,280 are shown in the following Table :—

TABLE VII.

Showing the Number and Quality of Vaccine Marks in 16,280 Children.

Vaccine Marks.	Excellent.	Fair and Passable.	Bad.	Total.
Four or More	706	724	401	1,831
Three -	1,818	1,555	864	4,237
Two - -	3,013	2,287	1,308	6,608
One - - -	1,459	1,216	929	3,604
Total -	6,996	5,782	3,502	16,280

Classifying the cases in four degrees of protection in the manner adopted in my report for 1860, the results are these :—

Per cent.

1. Best protected (having more than two typical marks) - - - - -	2,524	15·5
2. Well protected (having two typical marks) - - - - -	3,013	18·5
3. Moderately protected (having two or more passable, or one typical mark) - - - - -	6,025	37·0
4. Badly protected (having bad marks, or only one passable mark) - - - - -	4,718	29·0
	<u>16,280</u>	<u>100</u>

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Although the varying size of cicatrices required to be taken into account in determining the relative degree of protection of individuals, or of particular sets of children, the foregoing classification of the whole number inspected would not be materially affected by this consideration, the number of children in whom the size of cicatrix was below average having been fully as great as those in which it was in excess.

The conclusion that 29 per cent. of children nominally vaccinated were very imperfectly protected against smallpox, and that another 37 per cent. had only a comparatively moderate degree of protection, is a very serious one, and would be still more serious if it had appeared to depend on causes beyond control. But there was proof, the most conclusive to my own mind, that this was not so.

*Defect in number of marks.*—(1.) Where only two or three cicatrices existed, this had depended, in a large proportion of cases, on the vaccinators not having attempted to produce more. The facts demonstrating the superior protective value of a plurality of vesicles had not at that time been brought to their notice. So far the application of a remedy was obvious. But (2.) the defect had also been due to a large extent to the failure of vaccinators to produce the number of vesicles they aimed at. In very many children having two or three marks, the attempt had been made to produce more vesicles, but had failed; and in very nearly all the children having one mark only (22 per cent. of the whole number examined), there had been an attempt to produce two vesicles at the least. Now to those acquainted with vaccination as carried out by practised hands, under the best conditions, it is well known that the proportion of cases in which they fail to produce the full or nearly the full effect desired is very small. In order to have some standard of comparison, I examined, on occasion of a recent visit at the large stations in connection with the Privy Council at Birmingham, Manchester, and Liverpool, the registers for the preceding 12 months or thereabouts, and found that upon 2,770 cases of successful vaccination in which the exact result was recorded, the full number of vesicles had ensued, in considerably more than 90 per cent., and that a single vesicle had resulted in 1·3 per cent. of the cases only. The very large proportion of failures, therefore, observed in the inspected districts, must have been due either to the mode in which, or to the conditions under which, the vaccination had been performed: no doubt it was chiefly due to the frequent use of dry lymph, but also, to some considerable extent, to the use of liquid lymph taken with less opportunity of choice, or at a too late period of the vesicle, and therefore of less infective power.

*Defective character of marks.*—Although there can be no doubt that there are circumstances beyond control, which, in individual cases, will modify the course of the vaccine vesicle, and influence, therefore, the appearance of the cicatrices, my observations seemed clearly to establish that the defect in this respect depended mainly on circumstances for which the vaccinators themselves, and the conditions under which they worked, must be held responsible. The contrast between the work of various vaccinators as to the character of marks resulting was most striking, and rendered it impossible to come to any other conclusion. Take, for example, a few districts for comparison, in each of which the marking of a particular vaccinator, or of particular vaccinators, was either almost exclusively seen, or was very largely predominant.



TABLE VIII.

Showing the Character of Vaccine Marks observed in Nine well-vaccinated and in Nine badly-vaccinated Districts.

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I. Well-vaccinated Districts.				II. Badly-vaccinated Districts.			
District.	Vaccine Marks.			District.	Vaccine Marks.		
	Excellent.	Passable.	Bad.		Excellent.	Passable.	Bad.
A.	106	33	16	a.	13	34	41
B.	60	36	11	b.	12	30	41
C.	96	41	10	c.	8	20	33
D.	14	12	4	d.	33	41	45
E.	21	11	6	e.	28	52	49
F.	22	11	3	f.	18	36	24
G.	35	13	7	g.	12	24	16
H.	52	28	11	h.	26	30	18
I.	102	51	23	i.	19	30	23
Total -	508	236	91	Total -	169	297	300

In schools on the confines of two districts, and in schools in towns in which the work of different vaccinators was seen side by side, it was frequently not at all difficult to assign the children to their respective vaccinators by the quality of their marks.

It is quite impossible, however, to convey by tabular statement, or by description, the extent of difference seen between the results produced by different vaccinators; the striking, well-cut marks usually produced by some, the miserable, ill defined, often scarcely discernible marks very generally found as the result of the operations of others. It is a point respecting which a little experience will enable any one very speedily to satisfy himself.

The large amount of bad, and the still larger amount of second-rate, vaccination, found to prevail in many districts, appeared to have been due (1) to the great laxity which had heretofore existed as to the delegation of vaccination,—pupils and apprentices having been habitually employed in the work. In one district, in which the state of vaccination was particularly bad, I found that some of it had been performed by the female housekeeper of a late public vaccinator. (2.) To the vaccinator's low standard of what he ought to deem a satisfactory result of vaccination. From the fact that medical men have heretofore been left to pick up their knowledge of vaccination where they could, and that no test of knowledge has ever been applied, I have found them varying exceedingly in their estimate of a satisfactory vaccine vesicle. Many who held a low estimate could scarcely credit that marks, such as were habitually seen in other districts, were nothing more than the ordinary result of good vaccination. (3.) To the use, therefore, of inferior vesicles in propagating lymph, and to the use of lymph taken under conditions under which it would be of inferior infective power, as from exhausted vesicles, or from vesicles far advanced.\* There can be no doubt whatever that the

\* One vaccinator, the ordinary run of whose marks was scarcely larger than that of the head of a large blanket pin, said he could vaccinate 40 children from a single vesicle. In the practice of another vaccinator who would take lymph on the 10th or 12th day, there was an unusual number of large shining marks.

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difficulties which exist with regard to the maintenance of lymph under the arrangements now made for vaccination, not in country districts only, but in towns, and even in large towns, have led to a very large amount of inferior vaccination†.

On the other hand, the truly typical marks habitually produced by many vaccinators, who, without resorting to any new or special sources for their lymph supply, were simply uniformly careful in selection and application of lymph (but who had, in many instances, abandoned, as defective, the arrangements prescribed for them by their contracts, and had substituted other arrangements of their own), did not favour the hypothesis that there had been any necessary deterioration of lymph. I have seen several cicatrices, the results of the vaccinations of Dr. Jenner and Dr. Walker. The work of the vaccinators to whom I am referring will bear comparison with them. The vaccinations of Mr. Adams of Nailsea, Mr. Chubb of Torpoint, Mr. Berryman of St. Austell, Mr. Chalk of Eythorne, Mr. Williams of Whitstable, Mr. Cooper of Canterbury, and several others, were of conspicuous excellence.

I inquired carefully into the mode in which the practice of vaccination was now carried out. I found that, since the issue of the regulations, considerable changes had been made in the mode of vaccinating in many districts. Vaccinators had increased their number of insertions, and many who had heretofore made two punctures or scratches were now making three, four, and more ; or endeavouring to produce equivalent local effects. Of 189 vaccinators, of whom I had an opportunity of inquiring with regard to their present mode of carrying on vaccination, I found that all but 44 made at least three punctures or scarifications, or aimed at equivalent results ; and only one of these 44 ever made less than two punctures. The exact numbers were, as follows : making four or more punctures or equivalent scarifications, 61 ; making three punctures or equivalent scarifications, 84 ; making two or three, 4 ; making two, 39 ; making one or two, one.

The success attained was far from satisfactory, and this appeared due chiefly to the frequent use of dry lymph ; also, though in a much less degree, to the use of liquid lymph which had not been taken under the best conditions. The estimate prevailing of the success which was attainable was much too low. Mr. Marson's statement that a good vaccinator using every care should not fail to infect, at the first operation, above once in 150 times, is made with his usual caution, and must not be taken as representing results attainable by his own experienced hand alone. To test this, I examined, a short time ago, the registers kept at the stations in connection with the Privy Council at Birmingham, Manchester, Liverpool, and Bristol, and found that on 4,450 vaccinations performed within the preceding 18 months, in which the results were inspected, there were only 26 instances in which the child had not been infected on the first operation, or about one in 170. Now, from the very defective way in which the registers of the public vaccinators had generally been kept, it was only in a few instances that I was able to ascertain the results of their work with precision. But, from 10 accurately-kept registers, in districts in which a great deal of the vaccination was carried on with dry lymph, I found that on 3,041 vaccinations there had been 455 failures,

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† In towns in which active competition among vaccinators has existed, not only has the fear that a particular child might be taken to some other operator sometimes led to its vaccination under inferior conditions ; but the desire of securing children for vaccination, lest they should be taken to some one else, has led to the adoption by vaccinators of plans not at all conducive to good vaccination.



or more than one in seven: in two other districts, on 85 vaccinations, all or nearly all performed with dry lymph, the failures had been 31, or more than one in three. In another district, in which the vaccination was nearly all carried on with liquid lymph, but under conditions which admitted of improvement, the failures upon 1,230 vaccinations had been 39, or less than one in 30.

In my personal examination of children, I was much struck with the number I met with, in whom vaccination had been performed two and three times or more before it had taken effect, or who even yet, after a number of attempts, remained uninfected.

As to the completeness of the results attained, I am able to give still less precise information. It is not required of public vaccinators, by their instructions, to make any note of this, and I only met with one who, for his own information, had done so. This was in a rural district, but the arrangements made were such, that nearly all the children were vaccinated from the arm. The register showed that a single vesicle resulted in three per cent. of the cases, and that in 75 per cent. the full result sought (four vesicles) had been obtained. This degree of success is considerably below the standard I have before given; but the inquiries I made of vaccinators, and the results of examination of children, showed that generally (and especially where dry lymph had been much used) success had fallen very far short even of this. In dry lymph vaccination, indeed, complete success did not appear to be looked for with any confidence. Two or three vesicles for four insertions was considered a very fair result, and frequently there was but one. I often saw on the arms of children who had but one vaccine cicatrix the marks of two or three other abortive cuts.

These facts appear to me to point strongly and conclusively to the necessity of improving the conditions under which vaccination is carried on. But it was also very certain that the failures of a great number of vaccinators were such as no imperfection of conditions could account for, and were referable to the vaccinator's own want of care and knowledge in the selection of lymph, or want of skill in manipulation. A few weeks attendance and observation at any large vaccine station would assuredly have corrected many notions respecting vaccination, which I found prevailing.

It is an indispensable part of the duty of the public vaccinator to ascertain by personal inspection the results of vaccination before reporting them. This duty I found to be generally most faithfully discharged. In some districts, however, cases were occasionally reported on the mere statement of parties; and in a few, success (if the case were not seen again) appeared to be invariably, and of course often most erroneously, assumed. In one or two districts *re-vaccinations* had been performed wholesale, and returned to guardians as successful in every instance. It was admitted by the vaccinators that a large number of cases had not been seen again.\*

In a very large majority of the districts inspected, the work of vaccination was done entirely by the contractor himself. Several contractors, who had qualified assistants or partners, made a point of performing the vaccinations themselves, except under special circumstances; others employed their partners or assistants more frequently, or delegated the work almost entirely to them. In none of these cases had any endorsement of the delegation been made on the contract. In nine districts it was admitted that the services of unqualified assistants

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\* A vaccinator had returned 255 vaccinations as successful, who had only inspected the results in about 50 of them.

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and pupils were used ; and in four more, there was reason to believe that this was the case. But a very great change had taken place in this respect since the issue of the regulations.

In every instance but one the contractor for vaccination had the qualifications required by law. In this instance the special certificate was wanting : his vaccinations were not carried on in conformity with the instructions.

## III.—ARRANGEMENTS FOR THE PERFORMANCE OF PUBLIC VACCINATION.

In the preceding sections I have had occasion to refer to the defective arrangements which I found existing for the performance of public vaccination, and to their influence on the quantity, and still more directly on the quality, of vaccination.

These arrangements had been made under clause 1 of 16 & 17 Vict. c. 100., by which it is required that unions, if need be, be divided into convenient districts for vaccination ; that convenient places be fixed ; that certain attendances for the purpose of vaccination should be provided ; and that due public notice of these attendances should from time to time be given.

1. *Division into districts.*—I have already stated that in all the unions inspected, Stoke Damerel and Redruth excepted, the division of the union for the medical relief of the poor was the division adopted for purposes of public vaccination. This appeared to be a very convenient arrangement for rural districts and for towns which either constituted medical districts in themselves, or were entirely comprised each within a medical district. But in towns which were divided for purposes of medical relief, the adoption of this division for purposes of public vaccination had been most disadvantageous.

These disadvantages were especially seen at Bath, Bridgwater, Taunton, Exeter, Devonport,\* Plymouth, Truro, Dover. The population of each of these towns was such that the vaccination, to have been performed under the best attainable conditions, should all have been done at one station ; and unless due regard to the convenience of people as to distance to be travelled† required otherwise, this would have been the proper arrangement. The consideration of distance rendered two stations desirable in Plymouth and Devonport, but in every other town one would have sufficed. By such appointment of stations, with proper provision for attendances, vaccination might have been regularly maintained from week to week, and the advantage of vaccination from the arm secured for all children taken to the public vaccinator, with absolute certainty in the larger towns, and with all but absolute certainty in the others.

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\* The vaccination districts in Devonport (Stoke Damerel) were co-terminous with registration districts, but the effect of the division was the same as in the other places.

† Even in this respect my experience leads me to believe that erroneous estimates of what may be considered "convenient" have been taken. People do not object to go considerable distances for vaccination, when they are sure of getting it, and in the way they like, when they arrive at the station. What they do object to, and what is really inconvenient, is waiting at stations without seeing a vaccinator, or finding when they apply, they cannot then be vaccinated at all, or must be vaccinated with dry lymph. I have met with repeated instances of people passing stations at which they might have applied, for the sake of getting at one, far more distant, at which they were sure to obtain what they were seeking



But by the division adopted, there were in Bath 4 vaccinators, in Bridgwater 4, in Taunton 3, in Exeter 3, in Plymouth 5, in Devonport 5, in Truro 2, in Dover 2. And the consequence of this division, with injudicious arrangements with regard to attendances, had been more or less of dry lymph vaccination; vaccination from the arm under inferior conditions; vaccination often suspended, and sometimes for long periods together. The town in which vaccination was practically the best carried on was Plymouth, and this because, although there were five appointed vaccinators working at seven stations, the work was mainly done by two of them, each at a single station. Their vaccination was mostly done from the arm, but not altogether, and their opportunities of selection were too limited. In the great city of Bath, nearly all the so-called public vaccination (very insufficient in quantity, as I have already represented), was done with dry lymph at the dwellings of the people. In the towns of Ramsgate and Margate, though not subdivided into districts, the effects of subdivision had been produced by the appointment of several public vaccinators.

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2. *Appointment of stations.*—Generally, these were conveniently placed, but not always. Occasionally, in order that a station might be within two miles of the vaccinator's residence, and the higher rate of payment required for longer distances be avoided, it was placed at one extremity of a very large parish, and away from the centre of population. Again, in towns, the vaccinator's residence, which was generally the only station, was in some instances very inconveniently placed. The vaccinator of Lyme Regis lived half a mile out of the town; the vaccinator of Hayle a mile and a half away; the vaccinator of St. Mary's, Dover, at the very extremity of his district; the vaccinator of St. James', Dover, two miles out of the town, &c. &c. And in many rural districts, in which outlying stations had been abandoned because the frequent attendances at them required by contracts had been found useless, and in which no provision for attendance at regular but more distant periods had been made, the vaccinator's residence, often many miles distant from some of his villages, had become the only station.

3. *Provision for attendances.*—Provision was made by a large number of contracts for daily attendance; but this arrangement, as a provision "to vaccinate," was merely nominal, and had it been carried out would necessarily have implied inferior vaccination from the frequent use of dry lymph; contractors, for whom it was prescribed, worked generally by plans of their own.

Weekly vaccination was required in many contracts, and vaccination twice a week in a few; but in not more than two of the whole number of districts visited had it been found possible, with the existing division of unions, to maintain even weekly vaccination continuously. Either, therefore, the attendance was still given, and the vaccination performed under such conditions as could be secured (as in some of the districts of Devonport, Redruth, &c.); or vaccination at certain times only,—as during the summer, or at three or four periods of the year,—was offered; or any plan of attendances was abandoned altogether. In many contracts the provision was for attendance at one or more stations monthly, every two months, or once a quarter. This plan, if observed, would have rendered all vaccination from the arm impossible: but it was nowhere observed; and the vaccination of districts in which it was prescribed was carried on by modifications of the vaccinator's own, or by plans entirely different.

Unless where the attendances for vaccination had been made with

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some degree of regard to the number of children to be vaccinated, it was invariably found that they had soon ceased to be the attendances which the Act required, viz., "*to vaccinate*," and had become mere fictitious appointments. In many of the districts inspected, the appointments to vaccinate were found largely in excess of the number of children born in the district ; in some even three, four, or fivefold.

On this and other accounts the scheduled arrangements had, as I have before stated, been extensively disregarded. By 36 only of the contractors in the districts inspected was the public vaccination of the district even said to be carried on wholly in accordance with the schedules ; but in several of these instances it was doubtful whether the attendances had really been regularly given, and it was quite certain that, if given, they had, in a very large majority of cases, been fruitless.

By 54 of the contractors the vaccinations was said to be carried on partly in accordance with the schedules. By 123 the scheduled arrangements were wholly disregarded.

The registers of vaccinators were well and carefully kept in a few districts, but, generally, they had not been kept in a satisfactory manner. In many instances the entries, instead of being made at the time of performance of vaccination, were made at irregular and uncertain times, and even in districts in which entries were made regularly, the mode of recording results was usually very imperfect and unsatisfactory ; only in a few districts did the register correctly show the actual success attained in vaccinating. Source of lymph was seldom noted ; and re-vaccinations, when performed, had scarcely ever been distinguished. It is much to be regretted that the form of register now in use does not contain proper columns for the entry of all the points of which note is required to be made, and I have strongly to represent the importance of providing a better form.

4. *Public notices of attendances for vaccination* had been put forth in some unions regularly ; in others only occasionally and irregularly ; in many, had been omitted for many years. In Bath, in Wellington, in Taunton, even when smallpox was prevalent, no public notice had been issued. In consequence of the break-down of prescribed arrangements, the notices, when issued, were often at variance with the plans pursued. In some of the unions in which the issue of notices had been discontinued, it was stated as the reason for this, that it was well known the provisions published were never attended to.

## IV.—DUTIES OF REGISTRARS.

The delivery to parents of the required notice had been habitually omitted by the registrars of the Pitminster, Taunton St. Mary, and Taunton St. James' districts of the Taunton union ; of the Okehampton district of the Okehampton union, and of the Mylor and Constantine districts of the Falmouth union ; and occasionally omitted by the registrar of the Dartmouth district of the Totnes union. In one or two districts in which the notice was now punctually delivered, there was reason to believe it had been formerly omitted either habitually or occasionally. The omission by the registrars to deliver the notice is a very serious one, for it renders it impossible to take proceedings for non-vaccination.



The information respecting the times and places appointed for vaccination, which the Registrars are required to insert on the notice, was either not given at all, or was at variance with the schedules, in 75 vaccinating districts: in 86 of the 148 districts in which it was said to be given in conformity with the schedules, it was, in consequence of the abandonment of arrangements, incorrect and misleading: in many of the remaining 62 it was correct only in part.

The register in which the minute of notice given must be entered and the certificate of successful vaccination recorded, had been neglected by registrars of the following districts;—Pitminster, Taunton St. Mary, Taunton St. James', in the Taunton union; Okehampton, Hatherleigh, and Bratton Clovelly, in the Okehampton union; Wiveliscombe, Wellington, and Culmstock, in the Wellington union; Helston, in the Helston union; Camborne, in the Redruth union; St. Buryan and Uny-Lelant, in the Penzance union; Bridgwater, in Bridgwater union; Honiton, in the Honiton union; St. Aubyn, Morice, Stoke, and Tamar, in the Parish of Stoke Damerel; Paignton, Dartmouth, and Harberton, in the Totnes union; Mylor and Constantine, in the Falmouth union; Hythe, in the Elham union; Boughton, in the Faversham union. And the register had been misunderstood, and therefore wrongly kept, by the registrars of the Chardstock district of the Axminster union; of the Totnes district of the Totnes union; of the Egloshayle district of the Bodmin union; of the Stowey district of the Bridgwater union; of the Elham district of Elham union; of the City of Canterbury.

The entry of certificates was in most districts exceedingly imperfect from no fault of the registrars, but from the omission of public vaccinators and other medical practitioners to forward the certificates required under the Act. So far as the public vaccinators were concerned, I found that several board of guardians had recently resolved that they would in future pay no accounts on which the vaccinator did not certify that he had performed this part of his duty; and in all other unions in which it appeared that there had been omission in this respect, I took occasion to recommend this proceeding.

## V.—RECOMMENDATIONS, &c.

The recommendations which, as empowered by my instructions, I gave in each union, were directed to the establishment of such arrangements as would substitute a real and working system of attendances for the fictitious system generally prescribed by the contracts, would provide to the utmost practicable extent for vaccination from the arm, and would give notices to the public in accordance with the arrangements actually pursued.

In the towns enumerated at p. 51, I recommended consolidation of districts; and the performance of all public vaccination at two stations in Plymouth and Devonport, and at one station in the other places.

I recommended weekly attendances for vaccination wherever there was the least chance that vaccination could, with any proper regard for the conditions under which it ought to be performed, be continuously maintained.

Where weekly vaccination could not be properly maintained continuously, I recommended that it should be carried on at regular periods, adapted to the circumstances of the district.

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### II. Local inquiries as to Vaccination.

1. Somersetshire, Devonshire, Cornwall, and Kent.

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All the recommendations given fell under one of the three heads enumerated at page 94 of your last annual report.

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In those districts in which vaccination could not be continuously maintained, it was difficult to devise arrangements for periodical attendance which should fulfil the required conditions for the satisfactory performance of vaccination with due regard to all the technical requirements of 16 & 17 Vict. c. 100., and it appears to me in the highest degree desirable that there should be *in such districts* some relaxation of the limit of age by which the law now requires that vaccination should have been performed.

In places in which I found smallpox prevailing, I recommended measures in accordance with their Lordships' instructions under such circumstances. In the only towns in which there was any considerable outbreak, Truro and Exeter, I had an opportunity of ascertaining some time afterwards that the measures recommended had been promptly carried out, and that the epidemics had been arrested.

The suggestions which it was my duty to make were so received by local authorities, and the public vaccinators and registrars undertook with so much readiness and frankness to give effect to those parts of the laws and regulations respecting vaccination to which it was necessary to call their attention, that I feel justified in looking for great improvement in the state of vaccination of the districts now reported on.

2. Derbyshire, Staffordshire, and Shropshire.

2. Dr. STEVENS'S Summary of the results of his Inquiry in certain Unions of DERBYSHIRE, STAFFORDSHIRE, and SHROPSHIRE.

The Unions inspected by me were 32, viz., the union of Chesterfield, in Derbyshire; all the 17 unions of Staffordshire; and the 16 unions of Salop, with the exceptions of Shrewsbury and Cleobury Mortimer.

I propose to give the results of my inquiry under three heads, viz.:—(1) *Quantity*, (2) *Quality*, and (3) *Cause of Defect*, of Vaccination. Under the latter head, I shall review the different modes of carrying into effect those various enactments of the legislature, orders of the Privy Council, and directions of the Poor Law Board, which relate to public vaccination.

I must premise that I kept steadily in mind what I considered the primary object of the inquiry,—to render the vaccination of infants complete and efficient for the future, rather than to collect statistics of the past. These are indeed valuable, as showing the necessity for the inquiry; but a too keen pursuit of them would have consumed time which was employed to greater advantage in other ways.

*Quantity of Vaccination.*

There were found very few exceptions to the general statement, that the amount of infant vaccination was and for the last few years had been on the decline. See the accompanying Table A.

The average numbers of infants vaccinated to every 100 births registered in the 14 unions of Salop for the year ended 30th September 1858 were 55; whereas they were only 46 for the year ended 30th



September 1860. Again, analogous calculations applied to the unions of Staffordshire show 64 infants vaccinated to every 100 born in 1858, and only 61 to 100 born in 1860.

Although these calculations prove conclusively the general statement as to the falling off in the amount of infant vaccination, I fear they tend to error in another direction. The figures are only useful as comparing the infant vaccination of one year with that of another. That 61 per cent. of the infants born throughout Staffordshire in 1860, upwards of 25,000 in number, were vaccinated, is, I fear, far from correct. The apparent quantity of vaccination in the county greatly depends on the returns from the large and densely populated unions in the mining districts, more especially Walsall, Wolverhampton, and West Bromwich; in all of which there is reason to fear that much laxity, if not fraud, has been permitted to interfere with the strict integrity of the vaccination registers. The great differences in the proportion of infants vaccinated in different districts of these unions would of itself arouse suspicion of unfairness, were this argument rendered necessary by the absence of more conclusive proofs. I found that in the Bilston district of the Wolverhampton Union there were vaccinated, of children under one year of age, 103·8 per cent. of the births registered; while in the Willenhall and Wednesfield districts the per-centage was 62·8. Again, in the Bloxwich district of the Walsall Union the infant vaccinations appeared to bear the enormous proportion of 185·5 to every 100 children born; and this calculation, extending as it does over a period of three years, during the whole of which the rate varied very little, is conclusive both as to gross misconduct on the part of the contractor,\* and as to great neglect on the part of those whose trust it is to see, not only to the efficiency of the vaccination, but to the fair expenditure of the parochial funds.

In an agricultural union (Penkridge) in Staffordshire, a high percentage of infant vaccination had been attained in 1860; and here also I was given to understand that great irregularity prevailed in respect to vaccination, it being not infrequently found that children successfully vaccinated by one contractor were a few months afterwards operated on with like results by another.†

Though not of the same kind or extent as the above, there were other serious instances of great irregularity in the vaccination of the different unions, as also of the different districts of the same union. The highest rate of infant vaccination occurred in the widely scattered population of the Church Stretton Union in Salop, where, on an average of three years ended Michaelmas 1860, there appeared to have been vaccinated 89 infants to every 100 births registered, and the returns had all the appearance of being genuine. The lowest rate was found in the Leek Union in Staffordshire, where only 30 infant vaccinations were performed for every 100 births registered. The differences in amount among the different districts of the same union were very numerous and remarkable, extending from more than 100

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\* On inquiry into this circumstance by the guardians, it was clearly proved that the contractor had delegated the chief part of the vaccination of his district to an assistant, to whom he allowed sixpence per case for vaccination. This assistant had been in the habit of entering the fictitious names of children, as having been vaccinated by him. The assistant left the town, and the contractor was dismissed his post.

† Several instances were brought to my notice. I retained one certificate as an example of this; the registrar had others, and he stated that he had destroyed several. The certificate retained certifies the successful vaccination of a child of two years of age whose successful vaccination was registered as completed 10 months before.

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per cent. of the births registered in some districts down to nil in others ; and this disparity, in some instances, had continued for a considerable period. In the Clunbury district of the Clun Union in Salop the contractor acknowledged that he had not done any vaccination whatever for two years. In Ludlow Union, in two districts (Ludlow and Munslow), which represented two thirds of the entire population of the union, the infant vaccination in 1860 amounted to 7·7 per cent. of the births registered. Moreover, in this Union the proportion of older to infant vaccinations was in 1858 as 4 to 5 ; in 1859 as 1 to 2 ; and in 1860 as 2 to 1. The total infant vaccinations in the whole union for the last year were 16·4 per cent. of the births registered. In the Burton-on-Trent Union, the Burton district, containing almost half the entire population of the union, figured as having only 11 children vaccinated to every 100 born, this proportion extending over a period of three years ended 30th September 1860. There was a self-supporting dispensary at Burton, but no vaccinations were done at the Dispensary House, nor could I ascertain that any material amount was performed by other than the contractors. The population of this district was recently returned (1861) as 17,357. In the year ended Michaelmas 1859 only 5·5 per cent. of the infants born in it were returned as vaccinated. It is the practice here, as in other large unions in mining and manufacturing districts, for the poorer population to belong to clubs. The women are attended in their accouchements by the medical officer of the club, and the midwifery fee is held to cover the expense of vaccinating the child. In this way some amount of vaccination escapes notice ; and the system tends to diminish rather than augment vaccination, besides encouraging carelessness in its performance.\*

*Quality of Vaccination.*

In order to test the quality of the vaccination in the different unions of late years, many (196) national, parochial, and workhouse schools were visited, and 15,239 children examined therein. Statistics as to the vaccine cicatrices found on the arms so examined are submitted in table B.

With very few remarks this table may be left to speak for itself. Although the value of the cicatrices was assessed as much as possible in the favour of the vaccinator, yet, of the gross number of children examined, only 3·0 per cent. had four typical cicatrices, 6·8 per cent. had three equally good ; 26·7 per cent. had but two ; 25·5 had only one ; 15 per cent. were quite unprotected ; and the amount of immunity from death from small-pox of the remainder may be taken as very slight. With the view of acquiring evidence of the latest style of vaccinating in vogue in the different unions visited, I have separated the infant schools, and tabulated the results of their examination in a similar manner to that adopted with the mixed schools, table C. Of the total 15,239 given above, 3,590 were in 39 schools set apart for the youngest children, many of them mere babies, who were sent, for the most part, to be kept out of mischief, and some of whom could only just run alone.

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\* This club system is very injurious in many ways. The payment in some instances is only one penny per month (Wolverhampton), but owing to the great number of members they are enabled to offer 200*l.* or 300*l.* per annum as a salary. This tempts a young man to embark in practice in the neighbourhood ; and the attendance and medicine bestowed are probably somewhat shadowed forth by the rate of mortality among the mining population. Equally to be deprecated is the influence of burial clubs in infant mortality.



Here, those having four typical cicatrices were only 1·5 per cent.; just half the proportion so protected in the schools taken together. Those with three good marks were 4·9 per cent., as against 6·8 per cent. of the former table. Those having two were 25 per cent.; whereas in the mixed schools this proportion came out 26·7. Those having one mark only were more numerous, being 27·6 per cent., against 25·5; and 19 per cent. were not vaccinated at all.

As these calculations deal with large numbers of children, the conclusions must be regarded as very unsatisfactory.

Taking Mr. Marson's valuable statistics of the results of his observations on the relative value of different degrees of vaccination, and taking the examination of the arms of the school children as a fair sample of the general vaccination of the union or neighbourhood, I was compelled, while advising the Wolverhampton Board of Guardians on their future arrangements for making public vaccination more efficient, to make the following communication as to the quality of the vaccination in that union:—

\* \* \* \* "The great defect observable in your union was, however, the imperfect quality of the vaccination as evidenced chiefly by an examination of your schools. In upwards of 1350\* children who were examined I found 15 who were so vaccinated as to have a tolerably secure expectancy of immunity from death from small-pox; 50 whose vaccination justified their being classed with those who are liable to death from the same cause at the rate of  $1\frac{3}{4}$  per cent.; 381 might be considered as incurring *this* risk of death after their vaccination, at the rate of rather more than 4 per cent. The remainder varied in condition from that of entire want of protection to that of the least amount of security which any vaccination is known to give."

I must remind you, as stated before, that the Wolverhampton Union had in 1851 a population of 153,603 persons; that small-pox had been severely epidemic there of late at intervals of five or six years; that the deaths from this disease in the epidemic of 1850-1 amounted to 438, and in the shorter visitation of 1857 to 276. No further details are necessary on this subject, as the whole of my observations under this head are comprised in the accompanying tables. Suffice it to say, that Wolverhampton does not stand alone. In Walsall, with a population of 43,044, the quality of the vaccination was as bad; and in West Bromwich, with a population of 69,729, it was worse. These large mining and manufacturing unions compared very badly even with the Pottery unions, which approached them most nearly in the character of their populations and in the general arrangements for vaccination. However, they were far surpassed in some small urban unions, where the results of vaccination were materially influenced by the careful practice of some one or two contractors, as in Uttoxeter, Newport, Leek, and even Stafford.

### *Cause of Defect.*

The reason why children have, to the above-shown large extent, remained without vaccination, is to be looked for in the established machinery of public vaccination. And it will be well to pass in review the details of this machinery, and to show where any of them have been misunderstood, neglected, or openly set at nought.

The duty of making arrangements for the performance of public vaccination is imposed by the Vaccination Acts on the guardians of the poor. (1.) They are to see that the union is divided into districts for

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facilitating the practice of vaccination. This has been done, and the division into districts for poor law medical relief is that generally adopted. But in many unions these divisions are practically ignored, by allowing every medical practitioner to be a contractor for vaccination ; so we have in Wolverhampton four districts and 25 contractors ; in Wolstanton and Burslem, two districts and 15 contractors ; and in several others great if not equal disparity between districts and vaccinators. Moreover, as a general rule each vaccinator has the run of the union ;\* an arrangement which leads to discord among the vaccinators as a body, and to great difficulty in testing the value of their respective returns. (2.) Again, the guardians have in like manner literally complied with the Act by appointing stations for vaccination and times for the vaccinator to attend thereat ; and they have given public notice of times and places of attendance ; but the stations have very generally been allowed to fall into disuse. The occasions appointed for attendance at them were in many instances more numerous than the births of the whole district, and mostly were ill-judged and inconvenient ; and the public notices, besides being in general diffuse, and not likely to be understood or even read by the least educated classes (for which probably they are most necessary) have in very few unions been repeated since their original issue just after the passing of the Act. (3.) The guardians have also entered into contracts with medical men for the performance of vaccination. The contracts are almost uniformly of the form prescribed by the Poor Law Board ; they bind the guardians to pay a certain sum (almost always the minimum allowed by law) for every successful vaccination performed ; and the contractors, on their part, are to vaccinate applicants and to make certain returns ; but here the requirements end. The contractor is not bound in any way to see to the vaccination of his districts ; he vaccinates those brought to him ; but, from laxity in other quarters, these are few. Again, contractors had in every union assistants, qualified or unqualified—the latter much the more numerous—who vaccinated ; and in many instances the whole vaccination was delegated to them. In no instance was there made, in or upon the contract, any mention of a deputy ; nor was there any evidence that a deputy was recognized by the guardians. Yet in one instance, within the Walsall Union, the infantine vaccinations were made to appear more than 80 per cent. more numerous than the births, by the dishonesty of an assistant thus irregularly employed. And in numerous other unions the blame for irregularities was smoothly passed on to the shoulders of pupils and unqualified assistants. (4.) The “ Vaccination Acts Amendment Act, 1861,” is entirely permissive, and in no single instance has it been acted upon. In two instances, prior to its enactment, summonses had been taken out against parties who had neglected to have their children vaccinated ; in one of these cases a fine was recovered ; in the other, compliance with the Act and an apology were obtained ; but in the 32 unions inspected these were the only instances that came under my notice of action having been taken under the compulsory Act by the authority of guardians. One contractor had taken upon himself to put this Act in force, but from ignorance of details was unsuccessful and had to pay the costs.

This brings me to speak of the arrangements for public vaccination actually in existence. If these were judicious, there would be very

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\* This practice of vaccinating in any part of a union by a contractor holding a district therein is chiefly the result of the interpretation by the Poor Law Board of the first clause of the 3d and 4th Vict. c. 29. It seems to me that serious doubts may be entertained of the accuracy of this reading of the law.



little necessity or even occasion for putting in force the penal clauses of the compulsory Act. But the arrangements made by the guardians had been found so utterly useless, both as to stations fixed and times appointed for attendance at them, that they were soon ignored by the contractor; and at the time of my inspection I did not find one union in which the vaccination was carried on at the times or at the stations appointed by the contracts. The plan adopted was almost universally to vaccinate at the surgeries of the contractors "at any time," or for the vaccinator to perform the operation while making a round of professional visits; this mode implying of course an almost exclusive use of stored lymph. In some districts the contractors assured me that, although they did not attend the stations at the times fixed, nor even go to the appointed station at all, they did the great majority of their vaccinations from arm-to-arm direct, i. e., that they vaccinated a child or children in a certain district, and then arranged with the parents of other children living in the neighbourhood to attend at some convenient place for the purpose of having their children vaccinated from the source thus established. However, in many of the unions where this method was spoken of as being constantly in vogue, I have found, on an examination of the Medical Registers of Vaccination, so small a proportion of the cases preceded by others which had been vaccinated on the same day of the previous week, that I fear even this approach to systematic arm-to-arm vaccination does not prevail so extensively as I was told.

Here it will be observed that the contractors have voluntarily adopted modes of vaccinating which tend to give more trouble and tax their time more severely than short and regular attendances at fixed stations. In very many instances, at interviews I have had with contractors, very dismal pictures have been drawn of the amount of work and sacrifice of time exacted from them on account of vaccination; and they have pleaded very seriously that such labour, &c. was very insufficiently paid for. But then in densely populated unions even the statutory minimum of payment is not so very inadequate to meet the fair demand of stational vaccination. On all hands I was assured that the people would not attend at stations. But on satisfying the objectors (chiefly the contractors) that owing to the neglect of the guardians the public had never received proper information with a view to their so attending, they were always unanimous in averring that doubtless stational vaccination would prove far the more efficient and give the least trouble of any.

In most of the unions all unnecessary clerical work in respect of vaccination, such as the monthly return, duplicate registers, &c., had been very judiciously abolished. Where those were still required I urged their immediate discontinuance, this kind of work being very irksome to medical practitioners, especially to those who happen to be the overworked and very moderately paid officers of the guardians of the poor.

The medical register of vaccinations was in most instances fairly kept as an account book, but nothing more. No notice had been taken in this respect of the Privy Council Order of December 1859. In only one instance did I find any memorandum against the name of vaccinated children of the source from whence the lymph had been taken. There were some very wide departures from formality in keeping the registers, but they were not numerous.

One very common practice—that of inserting the patient's residence instead of "parish in which resident"—rendered it very difficult, generally impossible, for a person not well acquainted with the neigh-

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bourhood to compare the vaccination in parishes with the returns of the Registrars of Births. In some instances the ages were not inserted, and very constantly, when they were indicated, they were very far from correct. A new and more comprehensive register is much wanted.\*

As regards the mode of vaccinating, insufficient vesication and the use of stored lymph were the two characteristic faults prevailing in the unions visited. The former is in many instances the result of ignorance of the value of more than one vesicle, but is more generally caused (as will afterwards be explained) by the necessary hurry of the proceeding, or by the dictation of parents. The use of stored lymph was the direct consequence of the unsystematic way in which the vaccination machinery was worked. Probably throughout the Salop unions an unusually frequent employment of such lymph was the necessary consequence of the thinness of the population; in many places only one person to six or seven acres. Stations in very many of those unions could not be continuously worked. The hermetically sealed tubes of Mr. Husband, mentioned in the Privy Council's "Instructions to Vaccinators," were in use in some few places; but in by far the larger number of unions they had never been heard of. I had some evidence of their failure. One or two punctures, or one or two scarifications or scratches (each of the latter producing effects perhaps equal to two punctures), were the modes of operating; the two scarifications or scratches being rare; the two punctures the most common. Some of the contractors adhered to the practice of making only one. Many of the contractors stated that they made two, and some four punctures or scarifications on each arm; but this was only to the slightest extent, and in very few instances corroborated by the examination of schools within their districts, as reference to Tables B. and C. will prove.

Registrars.

The registrars, as a general rule, were a very intelligent body, anxiously desirous of doing their duty, and for the most part doing it very regularly. There were, however, some marked exceptions to this. The duty of the registrar, in respect to vaccination, consists in delivering to the parent or guardian of the child at the period of birth-registry, or within seven days afterwards, a notice of the parent's or guardian's statutory obligation in the matter. He has also to make a minute of this delivery in his register of successful vaccination. And, finally, he has to enter in his book the certificates of successful vaccination which are sent to him by the contractors. I found that the notices were very generally delivered and minuted, though this last was not so often done at the time as would be desirable. The registers were often only entered up once a quarter or once a month, or from time to time, or sometimes only on the receipt of the certificates of successful vaccination. Now, in many vaccination districts I visited, the adoption of this last mode had left the vaccination register a blank, in some instances, for many years. This occurred, so far as the registrars were concerned, from one of the following causes:—(1.) From misapprehension as to the proper way of keeping the book; the Registrar-General's instructions, as printed in the cover of each register, leading them astray; or (2) from the gross negligence of the contractors, who, in some instances, refused to send the required certificates, in others omitted to send them, and in most sent them very irregularly, hardly ever to the extent of the vaccinations actually performed, and generally so incorrectly and negligently filled up as to give very unnecessary

\* It is not likely that the stock of blank registers now on hand at the Registry Office will be soon exhausted, as they are but seldom applied for from any of the unions at present referred to. The Superintendent Registrars generally have them from their own printers.



trouble to the registrars, and often leave them at a total loss as to the identity of the child, whose name and age appear on the certificate, with any child whose birth had been registered.

This is often necessarily the case, even when the certificate is carefully filled up, inasmuch as the Vaccination Act requires that the certificate shall be sent to the registrar of the district in which the operation was performed. This district might not, often does not, embrace the place of birth; and in these cases the registrar has no opportunity of testing the accuracy of the certificate.\*

I also met with some instances in which the registrar was ignorant of the existence of the statutory notice, and more than one instance in which the registrar had never seen the vaccination register until a day or two immediately preceding my visit. I was informed that in one instance no register had been used, from ignorance of its existence, since the Act of 1853 was passed. I must add on this head that nothing tends so much to obstruct the vaccination of the multitude as the unfair treatment the registrars receive at the hands of the contractors in this matter of withholding certificates, without which the registrar gets no pay at all. The natural consequence is that he does not interest himself in the matter of vaccination, and thus the most valuable aid to its dissemination is lost. If necessary, this can be proved by the activity of registrars where they are otherwise dealt with. Here they look up the unvaccinated, furnish lists of such to the contractors for the district, and generally act as strenuous apostles in the cause; combating prejudices on the part of unwilling parents, and overcoming resistance where it exists. From their intimate knowledge of their neighbourhoods, and thorough acquaintance with the inhabitants, their value cannot be over estimated, and they ought to be paid properly.

The foregone statement of the way in which the guardians, contractors, and registrars perform their respective duties will, I think, sufficiently account for defects in the quantity of the vaccination in the different unions. I have written generally here, in the belief that the detailed particulars of each union which accompany this Report as an Appendix will furnish you with any more precise local information that you may require.

The cause of the defect in the quality of the vaccination, the falling short of the better kind, and the preponderance of that which affords less protection (the evil increasing inversely as the age of the child), must be sought for from other data. I believe it to be owing chiefly to the want of occasional inspection. That the vaccinators were for the most part aware of the importance of sufficient vesication I gathered from their statements to me as to their mode of operating; and it is evidenced by the somewhat greater efficacy of their former vaccinations. Their practice in this respect has been allowed to retrograde, partly from a feeling of security that any vaccination was paid for as well as the best, and partly owing to the altered circumstances in which the medical men who hold the contracts for vaccination are placed. At the passing of the Compulsory Act the machinery was new, and the best vaccination was offered to the public as a boon, for which they were in turn more or less grateful; but, partly from the slight interest taken in the subject by the authorities, partly from the fact that any tyro at the portals of pharmacy, and even quite uneducated

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\* To show to what extent this is an evil, I may state that in the vaccination register of one of the registrars of Stoke-on-Trent parish, the last 518 entries were of successful vaccinations of children born in a neighbouring district; of course they could not be verified. And, moreover, the registrar of the district in which these births occurred had a book almost blank, so far as the entry of certificates was concerned.



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persons, were allowed to vaccinate, partly from the unfair and unprofessional competition for subjects to be vaccinated, and the unworthy means adopted to procure them in many densely populated districts, the tables are completely turned. The public is apathetic with regard to what it is thus eagerly besought to accept. The people in their turn (as I have heard in many places during my inspection) confer the privilege of vaccinating their children as a great favour; and I have been assured on several occasions that when called upon to permit the vaccination of a child the parent has rejoined, "Well! you shall, if you will give so and so" (another child, or herself, or a neighbour,) "a bottle of medicine," &c. This reaction has led to vaccination being done under the direction of the mother or nurse: "You shall not make more than one puncture," being a common injunction. The vaccinator, engaged in such a hot pursuit of fees, delays not; he has no time to urge any argument he may have in favour of efficient as compared with merely nominal vaccination; he operates at once, lest haply another may outbid him. This is literally the plan of carrying on the vaccination in several of the larger unions in South Staffordshire, of which Wolverhampton may be quoted as a type. Though the statement is most applicable to places where there is undue competition, the same careless practice prevails in many of the unions in which the parochial medical officers are the sole vaccinators; only the pressure to do less than justice is in these cases not so great.

The best evidence I can produce of the advantage of inspection, and that its absence is in great measure the cause of defect in quality of the vaccination, is to be found in the result of my inspection of the parish of Stoke-on-Trent, where, some few years since, the Government instituted inquiries into the matter: there certainly was a marked improvement in the quality of the vaccination as compared with the large unions in the coal and iron districts. Though vigilance on the part of the guardians may do much to increase the quantity of the vaccination, they can hardly be expected to have at their disposal such independent means of inspection as would materially influence its quality.

In obedience to my instructions, that I should give "all advice and assistance for which I might 'be asked,'" I have not failed to do so. I could not state precisely in what this has consisted, without recapitulating most of the foregone part of my Report.

Wherever I have found defect, whether on the part of guardians, contractors, or registrars, in carrying out measures concerning which the law was precise and clear, I have speedily satisfied myself that the defect would be for the future amended. My proceedings in this respect have so varied with the special circumstances of each case that they could not here be specified in detail. I have been assured that the defect was the result of inadvertence; or, if I have detected a difference of opinion with myself on the subject, I have had an interview with the board, or the chairman, or some leading guardian, and have been satisfied in every instance that alteration would take place. In matters of faulty arrangement as to contractors, or as to stations or times appointed for vaccination, I have communicated at length by letter; always confining myself to an exposition of the general principles that should be followed in seeking improvement, and leaving the exact details in the hands of those who were most familiar with the locality and the peculiarities of its population.

In every written communication with guardians I have urged upon them the great desirability, if not paramount necessity, for their having, either by their board or by a committee thereof, regular periodic investigations into the state and progress of public vaccination. I have

Recommendation.



suggested that these should be held shortly after each regular quarter day; and that at these meetings, besides other ordinary relevant matters, the guardians should compare the medical registers of vaccination with the quarterly accounts for birth registry, and with the vaccination register of the registrars. This audit or investigation is much required; it would familiarise the guardians with the various orders and regulations bearing on the subject of vaccination, and the knowledge that these inquiries took place would act very beneficially on all concerned in the work.\*

Generally, to further vaccination, and to put down resistance to it from any cause, I have communicated personally with most of the ministers of religion in the districts I have visited, and with such other influential persons as were known to interest themselves in the welfare of their surrounding populations. I have only to add, that I have invariably met with the warmest co-operation, with reiterated statements that things were as bad as they could be, and with expressions of extreme satisfaction that Government was stirring in such an important matter.

APPENDIX.  
II. Local inquiries as to Vaccination.  
2. Derbyshire, Staffordshire, and Shropshire.

TABLE A.

UNIONS.	Population.	Births registered in 3 years ended September 1860.	Infant Vaccinations in 3 years ended September 1860.	Vaccinations above 1 year in 3 years ended September 1860.	Infant Vaccinations per 100 on Registered Births.					Number of Districts.	Number of Vaccinators.
					For 3 Years.	For 1858.	For 1859.	For 1860.	For 1861.		
Chesterfield - - -	50,145	6,856	3,833	1,384	55	56	46	61	—	10	10
Atcham - - -	19,053	1,570	804	213	51	74	32	47	—	7	7
Bridgenorth - - -	15,608	1,499	607	164	40	40	48	32	—	4	4
Church Stretton - - -	6,167	499	445	171	89	95	108	68	—	4	4
Clun - - -	10,103	1,066	373	363	34	25	42	36	—	7	5
Drayton - - -	14,160	1,317	507	210	38	41	35	38	—	5	5
Ellesmere - - -	15,239	1,306	704	189	53	60	49	51	—	7	7
Ludlow - - -	17,048	1,575	583	503	37	50	43	16	—	5	5
Madeley - - -	27,627	3,316	2,276	148	68	68	71	66	—	4	10
Newport - - -	15,620	1,470	473	452	32	—	21	45	—	4	4
Oswestry - - -	22,761	2,158	1,400	347	64	73	57	63	—	4	4
Shiffnall - - -	11,463	1,056	525	127	49	37	63	49	—	6	4
Wellington - - -	20,729	2,452	1,025	238	41	—	—	37	—	3	3
Wem - - -	10,625	966	466	186	48	57	37	49	—	4	4
Whitchurch - - -	11,370	1,054	403	211	38	38	44	31	—	5	5
Alstonfield - - -	—	—	—	—	—	—	—	—	—	—	—
Burton-on-Trent - - -	31,843	4,267	1,545	905	36	47	25	37	—	8	8
Cheadle - - -	18,142	2,217	1,440	660	64	67	59	68	46	4	4
Leek - - -	21,823	2,521	757	313	30	35	23	30	—	4	7
Lichfield - - -	25,093	2,395	1,251	489	52	54	48	53	—	—	—
Newcastle-under-Lyme - - -	20,814	2,843	1,913	257	67	68	66	67	—	3	3
Penkridge - - -	16,541	1,747	1,183	244	67	60	49	92	—	3	5
Seisdon - - -	13,857	1,485	625	220	42	44	43	37	—	5	5
Stafford - - -	22,632	2,179	878	322	40	48	38	33	—	4	4
Stoke-on-Trent - - -	57,942	8,576	5,407	1,019	63	71	58	59	—	6	18
Stone - - -	19,344	2,139	1,154	570	53	55	53	52	—	4	4
Tamworth - - -	13,941	1,515	869	230	57	51	60	60	—	4	4
Uttoxeter - - -	15,140	1,148	527	283	45	48	44	44	—	5	5
Walsall - - -	43,044	7,855	5,088	704	64	63	67	62	—	6	12
West Bromwich - - -	69,729	11,416	6,809	974	59	74	53	51	—	4	13
Wolstanton and Burslem - - -	41,916	7,110	5,202	720	73	79	71	68	—	2	15
Wolverhampton - - -	132,603	14,638	10,402	1,214	71	62	69	80	—	4	25

\* To show the necessity of this attention to the subject on the part of the guardians, as a means of gaining some knowledge of a matter in which they have sway, I may quote an observation made to me by the rector of a parish, who was also vice-chairman of the board of guardians. In fact, almost always in the chair, owing to the illness of the chairman. I called upon him, to direct his attention to several instances of gross short-coming in his union, especially the small quantity of vaccination done. He seemed much surprised, and rejoined, "But is not this a matter for the medical men? Do they not get some pay for it?"

## APPENDIX.

TABLE B.

## II. Local inquiries as to Vaccination.

2. Derbyshire, Staffordshire, and Shropshire.

UNIONS.	Children examined at mixed Schools.	4 Cicatrices.			3 Cicatrices.			2 Cicatrices.			1 Cicatrix.			Not Vaccinated.	Doubtful.	Under Vaccination.
		Typical.	Fair.	Bad.	Typical.	Fair.	Bad.	Typical.	Fair.	Bad.	Typical.	Fair.	Bad.			
Chesterfield -	690	9	0	0	16	27	8	153	79	29	163	77	48	67	14	0
Atcham -	103	5	3	0	7	5	1	21	15	1	22	7	3	13	0	0
Bridgnorth -	494	6	2	0	30	7	3	115	31	9	159	32	16	82	2	0
Church Stretton -	32	0	1	0	2	2	0	7	4	1	7	2	1	5	0	0
Clun -	192	8	1	0	6	6	1	41	29	8	36	22	10	18	6	0
Drayton -	24	0	0	0	2	2	1	9	3	1	3	0	1	1	1	0
Ellesmere -	30	1	0	1	2	0	0	2	5	1	9	1	1	6	1	0
Ludlow -	96	1	0	0	10	4	2	20	11	3	19	9	4	12	1	0
Madeley -	728	12	3	2	14	4	2	162	66	17	263	72	32	78	1	0
Newport -	161	20	7	1	11	0	0	58	16	4	19	8	6	11	0	0
Oswestry -	35	1	2	0	2	3	0	7	2	1	6	0	2	9	0	0
Shiffnall -	340	2	0	0	9	3	0	97	31	11	106	20	15	46	0	0
Wellington -	211	4	0	0	22	7	1	61	22	6	43	6	6	30	3	0
Wem -	17	1	0	0	0	0	0	2	0	0	8	1	1	3	1	0
Whitchurch -	5	0	0	0	0	1	0	2	0	0	1	0	0	1	0	0
Alstonfield -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burton-on-Trent -	685	14	3	2	72	15	3	173	30	5	177	38	22	129	0	2
Cheadle -	348	5	1	0	39	11	2	69	15	3	86	16	13	88	0	0
Leek -	579	41	13	2	44	12	2	163	24	9	123	20	19	107	0	0
Lichfield -	462	37	6	1	44	12	3	119	28	5	110	18	14	65	0	0
Newcastle-under-Lymc. -	1,023	23	4	1	56	12	5	298	76	11	318	69	31	119	0	0
Penkridge -	107	2	0	0	8	1	2	28	5	2	31	4	1	23	0	0
Seisdon -	74	0	0	0	10	1	0	26	5	1	16	3	3	9	0	0
Stafford -	702	34	6	1	93	17	4	163	48	10	129	22	19	154	2	0
Stoke-on-Trent -	1,674	106	24	10	196	53	10	436	83	23	409	51	42	224	0	7
Stone -	120	6	1	0	17	3	1	34	9	2	23	5	2	17	0	0
Tamworth -	538	10	0	0	57	5	2	149	14	1	147	16	15	122	0	0
Uttoxeter -	421	45	11	6	49	17	3	69	28	14	66	17	16	79	0	1
Walsall -	1,149	7	1	0	69	33	4	292	91	26	304	89	51	181	1	0
West Bromwich -	1,003	6	0	0	30	8	1	265	116	40	238	77	68	151	1	2
Wolstanton and Burslem. -	1,812	46	9	3	77	22	5	658	95	23	507	76	59	231	0	1
Wolverhampton -	1,384	15	3	1	50	25	4	381	128	34	353	90	70	216	5	9
Total -	15,239	467	101	31	1,044	318	70	4,030	1,109	301	3,001	868	591	2,297	39	22

TABLE C.

UNIONS.	Children examined at Infant Schools.	4 Cicatrices.			3 Cicatrices.			2 Cicatrices.			1 Cicatrix.			Not Vaccinated.
		Typical.	Fair.	Bad.	Typical.	Fair.	Bad.	Typical.	Fair.	Bad.	Typical.	Fair.	Bad.	
Bridgnorth -	49	2	1	0	3	0	0	6	4	2	10	1	3	17
Madeley -	325	3	1	1	6	3	2	61	34	10	105	36	15	48
Shiffnall -	124	0	0	0	2	2	0	34	9	3	41	6	3	24
Burton-on-Trent -	208	2	2	0	15	6	2	41	12	3	60	15	10	40
Cheadle -	125	2	1	0	11	4	0	29	5	1	30	4	4	34
Leek -	134	6	2	0	15	2	0	30	4	2	32	3	2	36
Lichfield -	51	2	1	0	6	2	1	8	0	0	14	2	2	13
Newcastle-under-Lymc. -	144	1	0	0	5	0	0	52	14	2	37	9	7	17
Penkridge -	19	0	0	0	0	0	0	4	1	0	4	2	1	7
Seisdon -	43	0	0	0	3	0	0	17	3	0	9	2	2	7
Stafford -	119	3	1	0	9	1	0	29	12	1	16	5	7	35
Stoke-on-Trent -	236	13	5	2	24	8	0	53	9	0	69	8	4	41
Tamworth -	175	0	0	0	12	2	0	33	10	0	56	6	2	49
Uttoxeter -	64	5	1	0	10	4	0	12	4	0	9	1	2	16
Walsall -	344	1	0	0	16	5	1	74	16	8	110	34	14	65
West Bromwich -	351	1	0	0	10	3	1	87	23	12	90	28	27	69
Wolstanton and Burslem -	664	13	2	3	23	9	2	221	33	6	190	41	17	104
Wolverhampton -	415	3	1	1	7	5	0	111	37	9	110	23	23	85
Total -	3590	57	18	7	177	56	9	907	230	59	992	226	145	707



RESULT of the EXAMINATION of Mixed Schools, showing the Number of Children found with 4, 3, 2, or 1 Typical Cicatrix per 100 of the Children examined.

APPENDIX.

Name of Place.	4 typical.	3 typical.	2 typical.	1 typical.	II. Local inquiries as to Vaccination.
Wolverhampton - -	1·0	3·6	27·5	25·5	2. Derbyshire, Staffordshire, and Shropshire.
Wolstanton and Burslem	2·5	4·2	36·3	27·9	
West Bromwich - -	·6	2·8	26·4	23·7	
Walsall - - -	·6	6·0	25·4	26·4	
Uttoxeter - -	10·6	11·6	16·3	15·6	
Tamworth - - -	1·8	10·5	27·6	27·2	
Stone - - -	5·0	14·1	28·2	19·1	
Stoke-on-Trent - -	6·3	11·7	26·0	24·4	
Stafford - - -	4·8	13·2	23·2	18·3	
Seisdon - - -	·0	13·5	35·1	21·6	
Penkridge - - -	1·8	7·4	26·1	28·9	
Newcastle - - -	2·2	5·4	29·1	31·0	
Lichfield - - -	9·2	10·9	29·6	27·3	
Leek - - -	7·0	7·5	28·1	21·2	
Cheadle - - -	1·4	11·2	19·8	24·7	
Burton-on-Trent - -	2·0	10·5	25·2	25·8	
Alstonfield - - -	—	—	—	—	
Whitchurch - - -	·0	·0	40·0	20·0	
Wem - - -	5·8	·0	11·7	47·0	
Wellington - - -	1·8	10·4	28·9	20·3	
Shiffnall - - -	·5	2·6	28·5	31·1	
Oswestry - - -	2·8	5·7	20·0	17·1	
Newport - - -	12·4	6·8	36·0	11·8	
Madeley - - -	1·6	19·2	22·2	36·1	
Ludlow - - -	1·0	10·4	20·8	19·7	
Ellesmere - - -	3·3	6·6	6·6	30·0	
Drayton - - -	·0	8·3	37·5	12·5	
Clun - - -	4·1	3·1	21·3	18·7	
Church Stretton - -	·0	6·2	21·8	21·8	
Bridgenorth - - -	1·2	6·0	23·2	32·1	
Atcham - - -	4·8	6·7	20·3	21·3	
Chesterfield - - -	1·3	2·3	22·3	23·6	

## APPENDIX.

3. Dr. SANDERSON's Summary of the Results of his Inquiry in  
ESSEX and Part of SUFFOLK.

II. Local  
inquiries as to  
Vaccination.

3. Essex and  
part of Suffolk.

The inquiry extended to the whole of the county of Essex (17 unions) and 12 unions in the county of Suffolk, in respect of each of which I have had the honour to present a separate report. The following is a summary of the most important facts therein recorded, relating to (1) the Public Arrangements for Vaccination; (2) the performance of the duties of Registrars; (3) the Quantity of Vaccination in each District as influenced by (4) the Times and Places at which Vaccination is actually performed or (5) other Causes; (6) the Quality of Vaccination; and (7) the Prevalence of Smallpox.

In pursuance of my purpose, I conferred with the clerks of all the unions or their deputies, with 139 public vaccinators, and with 92 registrars, also with many of the clergy and other persons of influence in the localities visited.

The following Table exhibits the names of the unions inspected, the number of vaccination districts and of public vaccinators, the proportion which the number of public vaccinations bore to that of the births registered during the three years ending Michaelmas 1860, and the number of children without marks of vaccination found in every hundred children examined in elementary schools, in each union :—

TABLE I.

Union.	Number of Vaccina- tion Districts.	Number of Vaccina- tors.	Number of Vaccinations in proportion to every Hundred Registered Births.	Number per cent. of Children examined without marks of Vaccination.
1. Billericay - -	5	6	56·0	10·9
2. Braintree - -	4	4	62·7	4·1
3. Chelmsford - -	10	8	50·2	13·8
4. Colchester - -	1	10	50·0	11·2
5. Dunmow - -	6	6	80·0	9·3
6. Epping - -	10	7	69·0	14·4
7. Halstead - -	5	6	38·4	19·9
8. Lexden and Winstree	9	9	67·2	9·3
9. Maldon - -	7	7	83·4	16·6
10. Ongar - -	7	6	91·5	
11. Orsett - -	5	5	81·6	6·6
12. Rochford - -	6	5	80·8	28·3
13. Romford - -	7	6	91·2	4·5
14. Saffron Waldon - -	8	7	59·1	14·3
15. Tendring - -	11	10	64·4	15·8
16. West Ham - -	1	20	109·4	5·3
17. Witham - -	3	4	43·4	21·5
18. Bosmere and Claydon	5	5	63·1	17·4
19. Bury St. Edmunds -	3	3	66·3	17·2
20. Cosford - -	4	5	86·6	6·7
21. Hartismere - -	6	6	88·5	14·1
22. Ipswich - -	3	6	56·7	15·4
23. Mildenhall - -	2	2	82·9	8·8
24. Risbridge - -	5	5	82·3	
25. Samford - -	5	5	69·4	19·6
26. Stow - -	8	8	63·8	13·5
27. Sudbury - -	6	7	79·6	15·4
28. Thingoe - -	8	7	87·0	12·2
29. Woodbridge - -	9	8	61·9	21·7
Totals - -	169	193		



I. *Public Arrangements.*

## APPENDIX.

Contracts approved by the Poor Law Board exist in 19 of the unions inspected ; in 13 of these there is a contract for each district ; in 6 there are contracts relating to some of the districts only. In 9 of the unions no contracts were forthcoming at my visit, but they were stated to exist or to have existed, and their stipulations were said to be in accordance with arrangements notified by the guardians. In one union (that of Bury St. Edmunds) it is stated that the guardians have not contracted; the district medical officers perform the functions of public vaccinators.

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk. Contracts.

The Contractor is bound to attend at stated times at the stations appointed, in all of the unions in which contracts exist, excepting in West Ham and Witham, where it is stipulated that they shall vaccinate daily at their surgeries. In the union of Dunmow, three of the contractors are required, in addition to their periodical attendance, to vaccinate from house to house.

Two of the unions have not been divided into vaccination districts, viz., Colchester and West Ham ; in the others the divisions for vaccination coincide with those for medical relief. In the union of Ipswich two vaccinators have been appointed to each district. In one district in each of the unions of Halstead, Maldon, and Witham an additional vaccinator has been appointed.

Division of Unions into Districts for Vaccination.

Notifications have been posted or circulated in most, if not all, of the unions at former periods ; but, with the exception that in certain unions the registrars are in the practice of delivering such notifications along with the notice of requirement of vaccination, they were not found to be in actual use in any of the unions visited.

Public Notifications.

Proceedings have been taken by the guardians under the Vaccination Act of 1853, in the unions of Lexden and Winstree, Ipswich, and Samford. Under the Vaccination Acts Amendment Act, 1861, the guardians of the union of Ipswich have appointed their clerk to institute and conduct proceedings in that union ; no informations had been laid at the time of my visit.

Proceedings before Justices.

It was found that, with one exception, all the contractors were qualified ; the wanting qualification (the special vaccination certificate) has been obtained since my visit. In four districts, vaccination is performed entirely by qualified medical practitioners who hold no contracts, but are in partnership with the several contractors. Vaccination is partly performed by deputy in twelve districts ; in three of these the deputies are qualified practitioners, in the remainder they are unqualified.

Qualifications of Contractors.

Excepting during the prevalence of smallpox it was found that the performance of revaccination at the public expense was very unusual. In many unions the impression was general among the contractors, that payment could not be demanded for such vaccinations ; it did not, however, appear that such payment had been objected to by the guardians in more than one instance.

Revaccination.

In twenty unions the register is kept by all the contractors ; in six, it is kept by some only ; and in three, by none. The register is in accordance with schedule B of the form of contract approved by the Poor Law Board in twenty-one unions ; other forms of books are kept in all of the districts of two of the unions, and in certain districts of three others.

Contractor's Register.

In two districts the register was found to contain entries of the source whence the lymph used in each vaccination was obtained. In one of these the number in the register of the subject from whom the lymph was taken was entered in the column headed observations.

## APPENDIX.

II. Local  
inquiries as to  
Vaccination.3. Essex and  
part of Suffolk.Divisions of  
Unions into  
Districts for  
Registration.Register of  
successful  
Vaccination.Delivery of  
Notice.Notification of  
times and  
places  
appointed for  
Vaccination.Proceedings  
taken by Re-  
gistrars in  
furtherance of  
vaccination in  
addition to  
their legal  
duties.Many of the  
Registrars are  
also Relieving  
Officers.

In the other a second book was kept in the form in use previously to 1853, in which were recorded the day of inspection, state of health, source of the lymph, and the number of vesicles obtained in each case. None of the contractors distinguished in their entries secondary from primary vaccinations.

## II.—DUTIES OF REGISTRARS.

The twenty-nine unions inspected are divided into ninety-three registration districts. The limits of thirty-seven of these coincide entirely with those of the districts for vaccination, several of the latter being comprised in one of the former. The limits of 52 districts have no relation whatever to the divisions for vaccination ; in the remaining four the correspondence is incomplete.

The "Register of successful Vaccination" is regularly kept in 46 of the districts ; it is irregularly kept in 32 ; and not kept at all in 15. The irregularity consists in all cases, excepting that of Bury, in the omission of the entries of children who die or leave the district before the registration of birth.

Eighty-nine of the registrars regularly deliver the notice of the requirement of vaccination ; two never deliver it, and two only occasionally.

Notifications of obsolete arrangements scheduled in contracts are delivered by 35 registrars ; of scheduled arrangements partially in force by 20 ; of obsolete arrangements not in accordance with contracts by 6. Two registrars notify arrangements in actual operation which have been substituted by the public vaccinators for those stipulated ; six registrars notify only the contractor's name, two only the name and place of vaccination. The remaining 22 registrars deliver no notifications whatever.

Special proceedings have been taken in furtherance of vaccination by 24 registrars, 19 of whom have furnished lists of unvaccinated children to the contractors, and 17 have made personal inquiries respecting infringement of the vaccination laws.

Forty-one of the registrars are also relieving officers. It is to be remarked, that in this number are included the majority of those who make special efforts in aid of vaccination in addition to their legal duties. Of those who furnish lists, 15 are relieving officers, and 14 of those who make inquiries. Twelve of the registrars are also public vaccinators ; of these five keep no register, two give no notice, and of the remainder, three give no notification. Of the whole number, two only take measures for the promotion of vaccination, and their exertions are confined to their own vaccination districts. From these facts it would appear as if the combination of the functions of registrar with those of vaccinator is by no means conducive to their effectual performance.



## III.—Quantity of Vaccination.

## APPENDIX.

TABLE II.

Showing the Numbers and Ages of those Vaccinated in each District, and the Number of Children without marks of Vaccination in the Schools.

II. Local inquiries as to Vaccination.  
3. Essex and part of Suffolk.

Name of Union.	Name of District.	Population.	Average annual Number of Vaccinations returned to the Poor Law Board for the three years ending September 29th, 1860.	Proportion of the annual Number of Vaccinations to every Thousand of the Population in 1851.	Number of Certificates annually received by Registrars.	Number of Children without Marks of Vaccination in every Hundred examined in the Schools.	Proportion of the Number of Persons above the Age of One Year to every Hundred of all Ages, vaccinated during the three years 1858-60.
Billericay -	Brentwood -	6,773	76	11.2	0	14.1	41.0
	Great Burstead -	3,720	83	22.3	62	8.7	35.0
	Mount Nessing -	1,212	41	33.8	46	—	20.0
	Wickford -	2,075	45*	21.7	0	9.5	40.0
Braintree -	Bocking -	5,408	121	22.3	64	12.1	6.9
	Braintree -	6,369	75	11.8	64	10.7	32.0
	Finchingfield -	2,594	78	30.2	45	—	18.0
	Weatherfield -	2,922	75	25.7	64	—	37.0
Colchester -	1st Ward -	7,851	40	9.1	0	} 10.3	7.5
	2d do. -	5,832	110	18.9	57		3.3
	3d do. -	5,760	168	29.2	53		10.0
	Other Vaccinators	—	162	—	66		20.0
Chelmsford -	Chelmsford -	11,601	244	21.0	0	15.1	44.2
	Writtle -	3,834	58	15.2	0	—	60.2
	Great Baddon -	3,110	38	12.3	0	—	44.7
	Stock -	3,127	28	9.2	0	11.4	75.0
	Ingatestone -	2,120	49	23.4	0	7.9	34.7
	Great Waltham -	3,478	102	29.4	0	—	50.0
	Broomfield -	1,264	13	10.4	0	—	76.9
Dunmow -	Bardfield -	2,244	69	30.7	40	—	2.4
	Dunmow -	3,554	115	32.3	94	7.8	22.8
	Hatfield -	3,451	107	31.0	72	—	36.1
	High Easter -	2,892	61	21.1	44	—	24.8
	Stebbing -	3,492	81	23.2	81	—	21.7
	Thaxted -	4,415	99	22.4	100	14.6	6.4
Epping -	Chingford -	964	23	23.8	2	—	13.2
	Parndon -	4,228	118	27.9	120	15.0	10.1
	Matching -	652	19	29.1	18	2.0	8.7
	Thoydon Garnon -	1,237	13	10.5	3	—	12.5
	Chigwell -	3,202	96	29.9	75	—	22.5
	Epping -	3,688	55	14.9	23	17.4	12.6
Halstead -	Halstead -	7,719	64	8.3	9	30.7	33.3
	Sible Hedingham -	2,840	26	9.1	0	24.0	41.6
	Colne -	3,330	72	21.6	0	3.8	35.9
	Castle Hedingham	3,467	62	17.8	0	10.6	19.2
Lexden and Winstree.	Brightlingsea -	1,852	23	9.0	} 106 {	—	50.0
	Winstree -	3,163	97	27.4		8.9	28.1
	Mersea -	2,199	66	31.6		2.5	32.9
	Layer de la Hay -	1,559	33	22.0		8.9	62.9

\* 2 years.

## APPENDIX.

TABLE II.—*continued.*

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

Name of Union.	Name of District.	Population.	Average annual Number of Vaccinations returned to the Poor Law Board for the three years ending September 29th, 1860.	Proportion of the annual Number of Vaccinations to every Thousand of the Population in 1851.	Number of Certificates annually received by Registrars.	Number of Children without Marks of Vaccination in every Hundred examined in the Schools.	Proportion of the Number of Persons above the Age of One Year to every Hundred of all Ages, vaccinated during the three years 1858-60.
Lexden and Wins-tree— <i>cont.</i>	Tey - -	2,695	57	21·8	46	—	60·8
	Dedham -	2,655	55	21·1	9	11·1	18·1
	West Bergholt -	3,260	98	29·1	57	4·5	46·7
	Chappel - -	3,075	89	27·5	54	—	32·8
Maldon - -	All Saints - -	3,152	59	18·7	0	—	69·3
	Bradwell - -	2,725	85	23·9	0	31·3	77·5
	Burnham - -	2,466	49	19·7	0	25·0	78·8
	St. Mary - -	2,768	98	35·4	49	} 15·0	{ 50·3
	St. Peter - -	5,235	149	24·4	100		
	Southminster -	2,422	91	37·8	0	11·8	96·2
	Tollesbury - -	3,370	98	29·1	64	—	68·0
Ongar - -	Blackmore - -	2,092	37	17·6	19	—	18·9
	Chipping Ongar -	4,344	123	28·3	69	—	26·8
	Fyfield - -	2,439	120	49·2	59	—	35·3
	Abridge - -	1,334	37	27·7	14	—	57·6
Orsett - -	Aveley - -	1,130	32	28·3	0	18·4	30·2
	Grays - -	2,668	73	27·3	71	—	7·4
	Ockendon - -	1,359	66	48·5	79	—	8·0
	Orsett - -	3,450	97	28·8	} 127	{ 4·4	13·7
	Stanford - -	1,423	42	29·5			
Rochford -	Canewdon - -	4, 47	149	32·0	17	28·5	55·0
	Hadleigh - -	1,474	47	31·9	0	45·9	55·3
	Prittlewell - -	4,274	108	25·3	84	—	9·3
	Rayleigh - -	2,717	62	22·8	0	34·6	70·0
	Wakering - -	2,539	104	40·1	0	—	14·4
Romford - -	Romford - -	9,317	343	36·8	0	4·5	81·6
	Barking - -	10,020	{ 182 }	35·9	{ 0	3·5	17·5
	Ilford - -					1·9	26·4
	Hornchurch -	4,084	134	32·8	0	0·8	58·9
	Warley - -	1,215	28	23·0	0	—	39·3
Saffron Walden -	Hempstead - -	827	33	40·0	29	—	10·0
	Clavering - -	4,453	94	21·1	36	20·9	41·1
	Chrisall - -	652	26	40·0	16	—	25·0
	Debden - -	4,993	106	21·3	113	5·9	16·9
	Walden - -	5,812	14	2·4	29	16·5	9·5
	Chesterford -	2,594	70	27·2	58	26·4	26·9
Tendring - -	Harwich - -	7,572	162	21·4	35	18·6	45·6
	Manningtree -	4,981	58	11·6	0	16·8	67·2
	Ardleigh - -	5,866	{ 30 }	20·1	{ 14 }	0·0	43·3
	Great Bentley -					—	8·7
	St. Osyth - -	2,977	54	18·1	33	—	7·4

\* The vaccination rates for this Union are calculated on the population in 1861.



TABLE II.—*continued.*

APPENDIX.

Name of Union.	Name of District.	Population.	Average annual Number of Vaccinations returned to the Poor Law Board for the three years ending September 29th, 1860.	Proportion of the annual Number of Vaccinations to every Thousand of the Population in 1851.	Number of Certificates annually received by Registrars.	Number of Children without Marks of Vaccination in every Hundred examined in the Schools.	Proportion of the Number of Persons above the Age of One Year to every Hundred of all Ages, vaccinated during the three years 1858-60.
Tendring— <i>cont.</i>	Walton -	2,285	53	23.2	34	—	11.3
	Thorpe -	3,031	70	23.1	} 45	{ —	17.1
	Tendring -	953	23	24.1		{ —	21.7
West Ham -	West Ham -	33,760	1,568	46.4*	839	6.1	26.3
	Walthamstow -	6,641	111	16.7	0	1.0	9.0
	Leyton -	4,333	60	13.8	45	5.8	8.3
	Woodford -	3,347	81	24.2	0	8.1	44.4
	Wanstead -	2,712	46	16.9	0	5.1	41.3
Witham -	Coggeshall -	4,875	38	7.8	44	31.9	31.5
	Kelvedon -	4,401	51	11.6	29	25.3	39.2
	Witham -	6,823	142	20.8	69	9.2	21.1
Bosmere and Claydon.	Claydon -	2,651	67	25.3	1	—	82.4
	Debenham -	4,558	45	9.8	66	29.0	26.7
	Needham -	3,202	56	13.9	20	14.6	32.2
	West -	2,680	64	23.9	8	—	31.3
	Coddenham -	3,713	98	26.4	5	—	16.3
Bury -	Bury, No. 1 -	13,316	136	20.4	136	} 17.2	2.9
	„ No. 2 -		58		58		1.1
	„ No. 3 -		54		54		0.6
Cosford -	Bildeston -	4,373	136	29.7	104	11.1	36.9
	Boxford -	3,604	109	30.2	113	6.8	14.6
	Hadleigh, No. 1 -	6,370	92	27.3	104	} 5.7	7.6
	„ No. 2 -		82		91		14.6
	Lavenham -	3,444	94	27.2	48	6.8	41.6
Hartismere -	Botesdale -	3,522	143	40.6	46	19.5	20.3
	Eye -	5,938	133	22.4	47	11.5	23.3
	Gislingham -	2,821	102	36.1	64	—	25.5
	Mendlesham -	5,137	142	27.6	49	15.2	29.6
	Palgrave -	980	7	7.1	1	—	20.5
Ipswich -	St. Clement -	37,880	234	18.4	21	} 15.4	48.7
	St. Margaret -		253		119		42.3
	St. Matthew, No. 1 -		69		0		42.0
	„ No. 2 -		105		56		53.3
Mildenhall -	Lakenheath -	5,496	154	28.0	143	10.1	10.4
	Worlington -	4,855	120	24.7	83	5.8	15.0
Risbridge -	Haverhill -	6,188	195	31.5	108	—	20.0
	Clare -	3,850	75	19.5	39	—	14.6
	Great Bradley -	2,995	59	19.7	55	—	8.5
	Wickhambrook -	2,836	111	39.1	98	—	10.8

\* The rates in this Union are calculated on the population (estimated) in 1859.

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

APPENDIX.

TABLE II.—*continued.*

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

Name of Union.	Name of District.	Population.	Average annual Number of Vaccinations returned to the Poor Law Board for the three years ending September 29th, 1860.	Proportion of the annual Number of Vaccinations to every Thousand of the Population in 1851.	Number of Certificates annually received by Registrars.	Number of Children without Marks of Vaccination in every Hundred examined in the Schools.	Proportion of the Number of Persons above the Age of One Year to every Hundred of all Ages, vaccinated during the three years 1858-60.
Samford - -	Capel - -	221	20	90·5	186 {	—	20·0
	Holbrook - -	4,288	97	22·6		—	27·8
	Wherstead - -	2,666	76	28·5		—	18·4
	Stratford - -	3,306	47	14·2		19·6	14·9
Stow - -	Stowmarket - -	3,899	48	12·3	0	16·0	45·8
	Woolpit - -	4,387	84	19·1	87	—	4·7
	Norton - -	2,430	86	35·4	25	—	41·8
	Haughley - -	2,425	71	29·4	14	—	22·5
	Combs - -	3,493	22	6·4	8	—	90·9
	Walsham - -	3,674	101	28·5	101	13·1	29·3
Sudbury - -	Hartest - -	3,318	83	25·0	95	—	1·9
	Melford - -	6,058	159	26·2	161	—	20·1
	Sudbury - -	10,318	202	19·6	159	17·7	13·8
	Cavendish - -	4,423	181	40·9	80	—	1·8
	Bures - -	3,902	89	22·8	73	—	6·7
	Nayland - -	2,815	100	35·5	86	11·7	10·0
Thingoe - -	Ixworth - -	4,861	195	40·3	134	20·4	57·1
	Barton - -	3,751	86	22·9	74	22·1	0·4
	Horningsheath - -	2,420	68	28·1	69	7·3	7·3
	Barrow - -	3,633	66	18·2	85	1·6	3·0
	Hengrave - -	1,918	49	25·5	51	—	3·4
	Ingham - -	1,736	46	26·5	36	—	3·5
Woodbridge - -	Alderton - -	3,429	107	31·2	54	—	28·9
	Melton - -	2,602	14	5·4	31	—	14·3
	Grundisburgh - -	3,208	93	29·0	99	—	2·1
	Wadringfield - -	3,875	96	24·7	94	20·9	31·2
	Woodbridge - -	6,154	67	10·9	39	34·2	23·8
	Bucklesham - -	1,376	47	34·1	38	22·6	29·8

Sources of information.

Information relating to the number of vaccinated and unvaccinated persons in the populations of the several districts inspected, was obtained (1) from the annual returns of vaccination furnished for each vaccination-district to the Poor Law Board, (2) from returns of births for each registration-district, kindly supplied to me in most unions by the superintendent registrars, (3) from the examination of children in the schools, and (4) from private inquiries relating to the number of vaccinations performed, either by contractors independently of their contract obligations, or by other practitioners. In three instances, the “register of successful vaccination” has afforded additional evidence.

The Annual Returns are often inaccurate.

In several unions the returns of vaccination were found not to agree with the contractors’ registers, the number of vaccinations returned being in some cases greater, in others less, than those of the entries.



These discrepancies were found to arise either from the inclusion of all the private vaccinations performed by the contractors (Cosford) or from the careless manner in which the materials for the returns were obtained. I found that in most of the unions each contractor was called upon to furnish yearly to the clerk a statement of the vaccinations performed by him, and that the return was merely a compilation of these statements. It may be readily understood that when the contractor either keeps no record, or enters his cases at irregular periods only, such a method is likely to lead to frequent errors. The returns are only worthy of confidence when they are based on the periodical charges for vaccination, and when these charges are checked by comparison with the contractors' registers. This plan is carried out in some unions with great regularity.

The comparison of the number of vaccinations with the population is in most instances the only method by which the returns can be made applicable to single districts, for the divisions for registration seldom coincide entirely with those for vaccination, and consequently the comparison of vaccinations with births is impossible. In those districts in which no material change has taken place in the population, the vaccination rate is a perfectly reliable criterion of the quantity of vaccination. In most of the districts in which I found that large migrations had rendered the census of 1851 useless as a basis of computation, I obtained from the superintendent registrars more recent information.

The quantity of vaccination not included in the returns can in general be estimated only approximately, and with great uncertainty, from the statements of practitioners. In the town of Bury St. Edmunds, where the registrar has received information of every primary vaccination performed for some years past, it appears that 106 persons are annually vaccinated at their own expense or gratuitously, the annual number of births being 410, of which, therefore, the number of private vaccinations amounted to more than a quarter. As there is no reason why such vaccinations should be more numerous in Bury than elsewhere, it is clear that in towns a vaccination rate, not exceeding three quarters of the birth rate, cannot be regarded as necessarily implying defect.

The prevalence of vaccination varies extremely, not only in different unions, but in different districts of the same union. The numbers of vaccinations in proportion to every hundred registered births varied in the districts from 12 to 123, and in the unions from 38 to 109. In order to determine to what circumstances the defect, sufficiency, or apparent excess, of vaccination, observable in each district, is to be attributed, no method is likely to be more successful than to select, for the purpose of investigation, those districts which are most remarkable either for the abundance or paucity of their vaccinations. The mode of operation of every circumstance, which appears to act as a cause of defect, or the contrary, must also be separately examined.

In the following 21 districts, extraordinary defect was indicated either by the vaccination rates or by the examination of the schools. In the six districts of which the names stand first on the list, *less* than 15 per thousand of the population had been vaccinated during the three years to which the inquiry relates, and *more* than 20 per cent. of the children in the schools were found to be without trace of vaccination.

In the succeeding districts, the vaccination rate was below 15·0. but the number vaccinated in the schools was greater than 80 per cent. The last series comprises those districts in which more than a fifth of the children were unvaccinated, but the vaccination rate was higher.

## APPENDIX.

## II. Local inquiries as to Vaccination.

## 3. Essex and part of Suffolk.

The Vaccination Rate, *i. e.* the number annually vaccinated in every thousand of the population is usually a good criterion of the quantity of Vaccination.

Private Vaccinations, *i. e.* those not performed under contract.

Causes of defect, sufficiency, or apparent excess of vaccination.

Districts in which there was extreme defect of vaccination.

## APPENDIX.

II. Local  
inquiries as to  
Vaccination.3. Essex and  
part of Suffolk.1st Series—Extreme defect, indicated both  
by returns and by examination of schools

Halstead.  
Coggeshall.  
Kelvedon.  
Debenham.  
Woodbridge.  
Sible Hedingham.

2d Series.—Ditto, indicated by returns only

Brightlingsea.  
Stratford St. Mary.  
Combs.  
Melton.  
Saffron Walden.  
Manningtree.

3d Series.—Ditto, inferred from examina-  
tion of schools only - - -

Bradwell.  
Hadleigh.  
Clavering.  
Chesterford.  
Barton.  
Waldringfield.  
Bucklesham.  
Rochford.  
Rayleigh.

## First series.

Of the six districts in the first series, all except one contain towns of considerable size. Of these towns Halstead, the largest, has a population of 5,658, and Kelvedon, the smallest, has a population of 1,633.

## Halstead.

In Halstead, where the people are more or less occupied in the silk manufacture, vaccination appears to have been neglected for many years, notwithstanding a severe outbreak of smallpox in 1846. Recently, this neglect has increased, insomuch that for some time past, the contractor himself states that his public duties have ceased. The defect is clearly due to the absence of any proper arrangements, and to the neglect of supervision. The contractor is content with vaccinating such children as may be brought to him at his surgery, and no steps are taken, either by himself, the guardians, or the registrar to induce or compel attendance. At Coggeshall and Kelvedon, the conditions, as regards the absence of arrangement, are similar; no epidemic of smallpox having occurred, to remind the people of the necessity of a prophylactic, the practice of vaccination appears to have gradually fallen into disuse among the lower classes. In the district of Debenham, the contractor attends at the stations appointed in his contract at times arranged and privately announced by himself. No supervision is exercised by the guardians, and the contractor has no assistance from the registrar; he was unaware until my visit that any defect existed. In the district of Woodbridge vaccination is performed in a very imperfect manner from house to house. The contractor states, that he arranges his visits according to lists of unvaccinated children furnished by the registrar; a plan which, in other hands, is found to produce good numerical results. In Sible Hedingham, the only entirely rural district included in the first series, the defect is due to the same causes as at Halstead.

Coggeshall.  
Kelvedon.Debenham  
(Bosmere and  
Claydon).

## Woodbridge.

Sible Heding-  
ham(Halstead).Second and  
third series.Brightlingsea  
(Maldon).

The districts included in the second and third series may be advantageously considered together. Four of them, Walden, Manningtree, Rochford, and Rayleigh, are partly urban, the rest are entirely rural. Brightlingsea is a populous and rapidly increasing village at the mouth of the Colne, the inhabitants of which are chiefly occupied in oyster dredging and other less commendable maritime pursuits.\* The con-

\* It will be remembered that a number of the fishermen of this village were recently concerned in a "wrecking" adventure on the Essex coast.



tractor arranges meetings for vaccination at his surgery at intervals, but complains that the people positively refuse to allow their children to be vaccinated. In the district of Stratford the contractor attends at the times and places prescribed by his contract. The defect is attributable partly to the want of due supervision and inquiry, partly to the unfavourable influence exercised by certain persons of local influence, who, although they have been subjected to prosecution, not only persist in their own refusal, but oppose vaccination among their poorer neighbours. In the district of Combs the contractor vaccinates at the proper stations, but not at the appointed times. No means are used to promote attendance, and much gratuitous vaccination is said to be performed. The contractor expresses his conviction that he has performed more vaccinations than he has returned, but keeps no record. The contractor for Melton resides out of his district, and vaccinates only on application at his surgery. No means are taken to induce people to attend.

APPENDIX.

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

Stratford, St. Mary (Saffron Walden).

Combs (Stow).

Melton (Woodbridge).

In the town of Saffron Walden the actual state of vaccination cannot be judged of by the vaccination rate (2·5). The contractor, although he has for some years declined to perform his contract duties, has continued to vaccinate all applicants at his surgery gratuitously. Notwithstanding this, the absence of public means of vaccination shows its effects in the undue number of unprotected children in the schools. Among children of all ages, 16 per cent were found without scars ; but in the infant school the proportion amounted to 33 per cent., so that, as regards the present state of vaccination, Saffron Walden deserves as low a place as Halstead or Coggeshall.

Saffron Walden.

In the district of Manningtree vaccination is performed at the times and places scheduled in the contract. The defect is in part compensated by the unusual number of private and gratuitous vaccinations performed in the town by a resident practitioner for his "club-patients."

Manningtree (Tendring).

The remote district of Bradwell forms the north-east promontory of the hundred of Dengy. It is from 12 to 14 miles from the nearest town, and is rendered more inaccessible than it would otherwise be by its almost insular position. During the three years 1858-60, the infantile vaccinations did not amount to more than 17 per cent. of the annual number of births. The contractor (who is also registrar) admits that he vaccinates "at any age;" his plan being to make special arrangements, from time to time, in the several villages of the district, for the clearing off of arrears. In 1859 an effort of this kind was prompted by the occurrence of a case of smallpox, in consequence of which 91 vaccinations were performed of which only 15 were infantile.

Bradwell (Maldon).

In the district of Clavering, as in Bradwell, the contractor had, for some years past contented himself with vaccinating such children as were brought to him, and admits that vaccination was much neglected, until in 1860, in consequence of the advent of smallpox, he at once appointed weekly meetings for vaccination in every village of the district, which were numerous attended. These arrangements continued in force only during the summer of that year ; at the time of my visit things had relapsed into their former condition.

Clavering (Walden).

In the village of Chesterford, in the same union, much of the vaccination is performed privately. This fact acts unfavourably, by diminishing that direct personal influence of the medical officers which, in many rural districts, is the most powerful agent in inducing the poor to submit to vaccination.

Chesterford (Walden).

Waldringfield is another district in which arrears have been allowed to accumulate. Large numbers of children have been vaccinated

Waldringfield (Woodbridge).

APPENDIX.  
II. Local  
inquiries as to  
Vaccination.

3. Essex and  
part of Suffolk

Canewdon,  
Rayleigh, and  
Hadleigh  
(Rochford.)

Summary of  
the causes of  
defect in the 21  
worst vacci-  
nated districts.

Districts in  
which the  
quantity of  
vaccination  
was sufficient.

1. Districts in  
which this was  
inferred from  
the returns.

recently in some of the villages in which cases of smallpox have occurred. A school examined in one of them was found to contain no children without scars of vaccination ; while at Waldringfield, the largest village in the union, the proportion of one in three were unprotected.

In the three contiguous districts of Canewdon (Rochford), Rayleigh, and Hadleigh, there was a remarkable disagreement between the apparent import of the returns, and the actual state of vaccination discovered in the school. The former showed that the vaccinations had considerably outnumbered the births during the period of inquiry ; while unvaccinated children were found in the schools in proportions varying from 28 to 50 per cent. This extraordinary defect appeared to be due, partly to neglect, partly to postponement : in one of the districts the mean of the entries of age in the contractor's register was 11 years and 9 months, and the per-centage of infantile vaccinations varied in the three districts from 30 to 45. Although the failure of public vaccination in this neighbourhood might be accounted for by the absence of all regularity or arrangement, either as to vaccination or inspection, it is at least partly due to special causes. It appears that during the last five or ten years a sect has come into existence, the tenets of which lead its members to repudiate all prophylactic expedients, and particularly vaccination, as unduly interfering with the Divine government. Proceedings which have been taken against some of these persons have failed to induce them to comply with the law.

From the preceding examination of the twenty-one districts in which the greatest defect of vaccination was met with, it appears in nearly half of them to be due to the mere neglect of all measures to promote vaccination. Of those contractors who employed such means, six visited from house to house, two attended at the times and places stipulated in their contracts regularly, two attended at the appointed places, but not at the appointed times, and one had substituted special arrangements of his own. In five of the districts the unusual prevalence of certain popular prejudices appeared to exercise a notably obstructive influence.

In the following twenty-eight districts the number of infantile vaccinations amounted to 24 per thousand of the population :—

District.	Infantile Vaccina- tion Rate.	Per- centage of Children Unvacci- nated.	District.	Infantile Vaccina- tion Rate.	Per- centage of Children Unvacci- nated.
Capel -	72·0	—	Matching -	26·6	2·0
Ockendon -	44·7	0·0	Horningsheath -	26·1	7·3
Cavendish -	40·1	—	Ingham -	25·7	—
Botesdale -	36·1	19·5	Boxford -	25·5	6·8
Hempstead -	36·0	—	Grays -	25·3	—
Wickhambrook -	34·9	—	Parndon -	25·2	15 0
Wakering -	34·4	—	Haverhill -	25·2	—
West Ham -	34·2	6·1	Lakenheath -	25·1	10·1
Nayland -	32·0	11·7	Dunmow -	25·0	7·8
Chrishall -	30·0	—	Orsett -	24·9	4·4
Bardfield -	30·0	—	Finchingfield -	24·8	—
Grundisburgh -	28·4	—	Hengrave -	24·7	—
Barking and Ilford	28·1	2·7	Hartest -	24·5	—
Gislingham -	26·9	—	Hadleigh -	24·3	5·7



In the following eight districts, although the infantile vaccination rate was below 24 per thousand, the examination of the children showed that the state of vaccination was numerically good; less than five per cent. of unvaccinated children being met with in the schools.

APPENDIX.

II. Local inquiries as to Vaccination.

District.	Per-centage of Children Unvacci-nated.	Infantile Vaccina-tion Rate.	District.	Per-centage of Children Unvacci-nated.	Infantile Vaccina-tion Rate.
Ardleigh - -	0'0	Notknown	Colne - -	3'8	13'0
Hornchurch - -	0'8	13'5	Stanford - -	4'0	22'2
Walthamstow - -	1'0	1'7	Romford - -	4'5	6'8
Mersea - -	2'5	21'1	West Bergholt -	4'5	15'5

3. Essex and part of Suffolk.

2. Districts in which it was inferred from the examina-tion of the schools.

The want of accordance between the vaccination rate and the num-bers of unvaccinated children found in the schools, appears, at first sight, unaccountable, and certainly cannot be referred to any general principle. It admits of explanation only in respect of each district separately. Some of the high numbers result directly from accidental causes : such as the habit of the contractor to vaccinate in his neigh-bour's district, or the occurrence of migrations of the population, which obviously deprive the rates of all significance as indications of the state of vaccination.

Want of ac-cordance of results of exa-mination of schools with the returns.

It is to be observed that most of the districts above enume-rated were rural ; the exceptions being West Ham, Barking, Romford, and Dunmow. They may be conveniently grouped according to their local distribution; for it was frequently observed, that in certain tracts of country in which, probably, vaccination had been performed for years with regularity it had become an established popular custom, and was attended to as a matter of course, even when the contractor made no effort to enforce it among his people.

Groups of con-tiguous dis-tricts in which vaccination is popular.

The union of West Ham, which forms but one vaccination district, includes the very populous metropolitan suburbs of Stratford, Plaistow, and Canning Town, and the suburban villages of Walthamstow, Ley-ton, Wanstead, add Woodford. The annual number of vaccinations was 1,991, during the period to which this inquiry relates, 1858-60. The population of the whole union has increased at the rate of 5'6 per cent. per annum. Supposing the increase to have been equable, the population must have been 50,150 at the middle of that period, and consequently 37 persons must have been annually vaccinated in every thousand. This result agrees with that afforded by comparing the number of vaccinations (1,991) with that of the births, which was 1819. In so large a total, it might be anticipated that an undue proportion would be found of vaccinations "above one year;" but even if we deduct all except infantile vaccinations, we have a remainder of 1,487, implying that no less than 95 per cent. of the children were vaccinated within a year of their birth. The distribution of this excess of vacci-nation in the districts, for which the union is divided for the purposes of registration and medical relief, is shown as follows :—

West Ham.

Excess of vaccination.

APPENDIX.

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

Registration Districts.	Births.	Vaccinations.	
		At all Ages.	Under one Year.
Stratford and West Ham	4,124	5,078	3,793
Walthamstow	797	574	425
Leyton	538	318	244

From these numbers it appears that the balance in favour of vaccination belongs entirely to the districts of Stratford and West Ham, whereas those for the other two districts evidence considerable defects.\* The examination of the schools throughout the union, which extended to 1,753 children, showed that 95 per cent. of them had marks. The per-centage of children without scars varied in the several medical districts from 1 per cent. (Walthamstow) to 8 per cent. (Woodford). The complete absence of relation between the number of public vaccinations returned and the number of unvaccinated children is readily explained by the social differences between the populations. At Walthamstow and Leyton the upper and middle classes predominate, at Stratford the poor.

Irregularity of vaccination in the district of Stratford.

The exceptional state of vaccination in the district of Stratford, above described, may be accounted for by the density of the population, and the liberality of the remuneration offered by the guardians. The plan which is in operation in this union is rather to be regarded as a scheme for subsidizing private vaccination than as a system of public vaccination. Every practitioner is a contractor, or may become one if he choose, the only conditions exacted being, that he will keep a register and vaccinate all applicants at his surgery. During the three years, 1858-60, vaccinations were performed by 21 practitioners, who, as regards their general method, may be divided into two classes. The first comprises those who perform exclusively vaccinations arising out of their midwifery practice; the second consists of practitioners who devote their leisure to "hunting up" vaccination cases, that is to soliciting the poor to have their children vaccinated. Such vaccinations are performed at irregular times and places, according to the convenience of the operator. Most of them take place at the houses of the parents, but many parents are induced to attend at the surgeries.

Romford Union.  
Satisfactory state of vaccination at Barking.

Ilford.

All of the districts of the union of Romford (Barking, Ilford, Hornchurch, and Romford) are well vaccinated numerically. In the town of Barking vaccination has been successfully carried out for some years past by the unaided efforts of the contractor. His success is due to the intimacy of his relations with his people, by means of which, without any assistance from the registrar, he is enabled to keep himself informed of all the children requiring vaccination. In Ilford, the present state of vaccination is numerically as satisfactory as in Barking, but the infantile rate is lower, and the mean of the entries of age in the contractor's book is 2 years and 11 months. In consequence of the

\* The facts stated in the text seem to admit of only one explanation; viz., that a certain number of infants are vaccinated in each year more than once. In the districts of West Ham and Stratford, the infantile vaccinations were in 1860 all but equal in number to the births, and in 1859 more infants were vaccinated than had been born in the year preceding. If due allowance be made for deaths under three months, and private vaccinations, what other conclusion is possible?



occurrence of a few scattered cases of smallpox, arrears have been recently cleared off. In the town of Romford, almost all the children are now vaccinated. In the summer and autumn of 1859 smallpox prevailed very generally, and proved fatal to seven persons in the town. Numbers of unvaccinated persons consequently applied to the contractor, so that 1,018 vaccinations were performed in the district, of which only 310 were infantile, a fact which affords conclusive evidence that vaccination must have been grievously neglected. The clearing off of arrears continues: 192 children, of the mean age of 8 years and 7 months, have been vaccinated during the last two years in the national schools at Hainault Forest, Havering, and Dagenham. In this district, weekly attendance had been maintained at the appointed stations, but since the occurrence of smallpox special appointments have been made. In the rural district of Hornchurch the coincidence of a small per-centage of unvaccinated children with a low infantile vaccination rate, implies a general habit of postponement rather than neglect. The contractor holds the office of registrar, and by means of it is enabled to ensure the complete vaccination of the people.

## APPENDIX.

## II. Local inquiries as to Vaccination.

## 3. Essex and part of Suffolk.

## Romford.

Vaccination at Hornchurch complete, but unduly postponed.

Following the northern bank of the Thames, the next districts are those of Ockendon and Orsett, both of which are completely vaccinated, as is evident as well from the returns as from the examination of the schools. Both of the contractors have entirely discontinued attendance at the places and times prescribed in their contracts, but appoint meetings for vaccination at half-yearly intervals. They vaccinate, by mutual agreement, patients residing in each others districts.

## Orsett and Ockendon.

The district of Wakering stretches from Shoeburyness to Foulness Point. Great part of it is marshy, and it comprises the alluvial and often inaccessible islands of Foulness and Wallasea. The contractor performs all his vaccinations from house to house. His practice is "undisputed," and as registrar he is able to keep himself informed of every birth. As soon as a child attains the proper age, he sends the parents a notice by post of the time at which he will call for the purpose of vaccination, and states that he never meets with refusal. The high vaccination rate shown in the table is readily accounted for by the rapid increase of the population of one parish in the district, that of Shoebury, which has progressed from 150 to 1,500.\*

Wakering (Rochford): complete vaccination, although many parts of the district are difficult of access.

A group of thoroughly well vaccinated districts, including the two towns of Nayland and Hadleigh, is situated on the confines of Suffolk and Essex, north of Colchester. In the district of Nayland 32 infants are annually vaccinated in every thousand of the population; but 11 per cent. of the children in the schools were found to be unvaccinated. The contractor vaccinates partly at his surgery, partly at the houses of his patients. He obtains information regularly of all cases of neglect from the registrar, and makes personal inquiries when necessary. As, in Nayland, many of the children are "private patients" of an opponent, these inquiries cannot be made, and in this way some of the children escape vaccination.

## Nayland (Sudbury).

At Hadleigh and Boxford the arrangements are similar, but the work of "looking up" the cases is performed by the registrar himself, not by the contractor. In both districts few unscarred children were met with, and it is worthy of notice that none were found in the infant schools. At Hadleigh two contractors are in office; although opponents, they mutually aid each other in the performance of their public duties.

## Hadleigh and Boxford.

\* In the district of Wakering, the annual number of vaccinations amounted to 95 per cent. of that of the births.

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## 3. Essex and part of Suffolk.

## Mildenhall.

In the union of Mildenhall, which comprises only two vaccination districts, the state of vaccination is not correctly represented by the vaccination rates, for since the last census a large emigration of agricultural labourers has occurred in the neighbourhood, which has affected the district of Worlington much more than that of Lakenheath. The comparison of the numbers of vaccinations with those of the births gives 73·4 as the per-centage for Lakenheath, and 98·9 as that for Worlington. In the latter district, the per-centage of infantile vaccinations was 83·8, and only 5·7 per cent. of children without scars were found in the schools. Attendance at the times and places scheduled in the contract is maintained with great regularity in the district of Lakenheath, but in that of Worlington, this plan, although formerly in operation, has entirely failed, excepting in those villages which are in the immediate neighbourhood of the contractor's residence. It is remarkable that the quantity of vaccination is one third greater in the district in which domiciliary vaccination is practised than in the other.

## IV. TIMES AND PLACES AT WHICH VACCINATION IS PERFORMED.

The public vaccinator is required by his contract to attend for vaccination at the times and places mentioned in the schedule A. thereto annexed. Of 136 contractors, only 8 conformed to this requirement; by the remaining 128 contractors it was disregarded,—by 26 of them partially, and by 102 of them entirely.\*

Arrangements for vaccination actually in force; their influence in increasing or diminishing the annual number of vaccinations.

The practice the same of contractors as regards times and places for vaccination may be described under the following heads:

I. No means are employed to induce parents to have their children vaccinated, in which case

- a. The contractor vaccinates on application at his surgery only;
- b. He attends at the stations at the times and places scheduled in his contract; or
- c. He vaccinates the children of his pauper patients at their parents residences, as well as on application.

II. Parents are *required* to have their children vaccinated.

- a. By the contractor, who may either
  - $\alpha$ . Vaccinate on the spot at the house of the parent so required;
  - $\beta$ . Appoint the parents of several children to meet at any convenient place, usually at one of their cottages; or
  - $\gamma$ . Appoint a time for attendance at a stated place of meeting or station.
- b. By the registrar, who may direct the parents to attend
  - $\alpha$ . At the times and places scheduled in the contracts or appointed by the guardians; or
  - $\beta$ . At times and places appointed by the contractor.

Variations of the vaccination rate according to the arrangements in operation.

In the districts of 136 contractors which are included in my inquiry, the varieties of practice above described are adopted as follows:

In 9 districts vaccination is performed at the surgery of the contractor only. In these the average of the numbers of vaccinations annually performed in every thousand of the population is - - 9·5

In 6 districts in which applicants were vaccinated at the appointed stations, and at the times scheduled in the contracts, the mean of the vaccination rates is - - - - - 16·8

\* In those Unions in which the contracts were not forthcoming, information as to public arrangements could only be obtained from the printed notifications promulgated by the guardians.



In 26 districts in which the contractor also vaccinates the children of his district patients at their residences, the mean of the vaccination rates is - - - - - 20.1

In the above 41 districts no supervision of vaccination is exercised either by the contractor or by the registrar. In the following 87 districts, the contractor himself employs more or less systematic means to induce parents to have their children vaccinated.

In 29 districts, the contractor ascertains from time to time, either from the register of births or by other less effectual means, what children are of fit age for vaccination, and visits from house to house for the purpose of performing the operation. In these districts the mean of per-centages is higher than in any of the rest, viz. - 28.5

In 41 districts the children are likewise vaccinated at the residences of their parents; but arrangements are made in order that several should be assembled for vaccination in the same house or cottage. In these districts the prevalent rate is - - - 27.0

In 17 districts the contractor announces meetings from time to time at stations appointed by himself or by the guardians. In these the mean of the vaccination rates is - - - - - 25.1

In 8 districts vaccination cases are "looked up" by the registrar, although no means for the purpose are taken by the contractor. In 4 of these, applicants only are vaccinated, in the remainder the contractor visits from house to house. In the former the prevalent rate is - - - - - 25.7

In the latter - - - - - 20.8

The numbers given above justify the inference that arrangements in themselves have but little effect in extending the practice of vaccination, unless they are combined with measures of supervision, and that supervision without arrangement is more effectual than arrangement without supervision.

Although, however, the "looking up" of cases by the vaccinator will always tend to promote vaccination in a district, the extent of this success varies not only according to the activity of such supervision, but according to the manner in which it is exercised. Some contractors depend entirely on that legitimate personal influence which they possess with their poorer patients, in the confidence that whatever they advise will be complied with. In other instances, when the relation between the medical officer and his patients is less satisfactory, he is compelled to resort to intimidation or persuasion. The expedient of frightening parents into compliance, even if at first it should appear efficacious, is apt soon to fall into contempt. The other plan of "soliciting" or "touting" for vaccination cases, is so unworthy and derogatory that even if success could be obtained by it, it would be too dearly purchased. All of the most successful vaccinators that I have met with have avoided having recourse to any of these expedients, and have employed their professional influence as the only persuasive means; and it will be found that in all the districts in which vaccination has been most largely practised, its popularity is more directly owing to the possession and exercise by the vaccinator of this power, than to any other cause.

In those districts in which no supervision is exercised, it is observable, that domiciliary vaccination produces higher rates than attendance either at surgery or stations. It can be readily understood that the mere vaccination of applicants at the surgery, is likely to be a very ineffectual provision for public vaccination, especially when the surgery is at a great distance from some parts of the district, or even beyond its limits.

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## II. Local inquiries as to Vaccination.

## 3. Essex and part of Suffolk.

Importance of supervision, i. e. of systematic personal inquiry into every case of neglect or postponement. Employment of undue means to induce parents to have their children vaccinated.

Domiciliary vaccination is more popular than vaccination on application.

APPENDIX.

II. Local inquiries as to Vaccination.

3. Essex and part of Suffolk.

Periodical vaccination of applicants at stations, without supervision, fails to produce satisfactory results.

Vaccination at times and places occasionally appointed and announced (which implies supervision) is much more successful,

but is apt to lead to undue postponement.

Yearly appointments are particularly liable to this disadvantage.

Periodical stational vaccination, in conformity with the stipulations of the contracts, was found to be in operation in only six districts, viz., Manningtree, Stratford, Bromfield (Chelmsford) Southminster (Maldon), Thaxted (Dunmow), and Prittlewell (Rochford). In two other districts, Lakenheath and Woolpit (Stow), although the times of attendance were not in strict accordance with the schedules, the arrangements were of the same nature. The two first of these districts have been already referred to as examples of extreme defect of vaccination; in both attendance at the stations was said to be regular; the contractor for Stratford states, that he attends monthly at all the stations appointed, and that at one of them six successive attendances were given without a single application. The third and fourth, Bromfield and Southminster, might have been included in the same category, but as regards these districts, the returns are so imperfect as to afford no evidence. In Thaxted and Prittlewell the rates were severally 22 and 25; but in the former 14·6 per cent. of the children in the village were without trace of vaccination. The district of Lakenheath, which forms the northern half of the union of Mildenhall, has been already referred to and compared with the other half, in which domiciliary vaccination is practised. At Woolpit periodical stational vaccination has been maintained for many years, both by the present contractor and his predecessor. He states that the people are habituated to the practice, and attend regularly, both for vaccination and inspection, but the returns show that many must neglect to do so.

Among the districts in which cases were “looked up” by the contractor, it did not appear that there was any material numerical difference between those in which vaccination was performed at the residence of each child, and those in which meetings were appointed. The comparison of six districts in which the contractor made his visits for vaccination with the most regularity, and appeared to take the greatest pains to inform himself of all children requiring vaccination, with an equal number of districts in which meetings for vaccination were most regularly appointed and effectually announced, shows that in the first series the sum of the vaccinations amounted to 30·6 per thousand of the population of the six districts (25,840); and that in the second series the corresponding rate was 33·7, the population being 27,463. But the comparison of the infantile rates gives an opposite result; for in the same groups of selected districts, the numbers per thousand of children vaccinated “under one year,” was 24·7, where the contractor visited from house to house, but only 15·9 where meetings were appointed; thus showing that such appointments, even if they promote the extension of vaccination generally, are apt to lead to its undue postponement.

That yearly arrangements would have a marked influence in the same direction might be expected. The following table of the number and ages of persons vaccinated in six districts in which vaccinations are performed exclusively at annual periods, serves to justify the anticipation :—

District.	Vaccination Rate.	Proportion of Infantile Vaccinations to every hundred Vaccinations at all Ages.	Mean of the Entries of Age in the Contractor's Register.
Waltham (Chelmsford)	29·4	50·0	3 years 1 month
Romford (Romford)	36·8	18·4	4 " 3 "
Chappel (Lexden)	27·5	67·2	1 " 2 "
West Bergholt (Lexden)	29·1	53·3	3 " 7 "
Walsham (Stow)	28·5	70·7	2 " 7 "



With these districts the following in which vaccination is performed at regular, but more frequent periods, may be favourably compared as regards the age of those vaccinated :—

District.	Vaccination Rate.	Infantile Vaccinations per cent.	Periods.
Hartest (Sudbury) - -	25·0	98·1	3 times a year.
Bardfield (Dunmow) - -	30·7	97·6	do.
Dedham (Lexden) - -	21·7	81·9	do.
Haverhill (Resbridge) - -	31·5	80·0	do.
Nayland (Sudbury) - -	35·5	90·0	Every 6 months.

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V.—OTHER CAUSES WHICH AFFECT THE QUANTITY OF VACCINATION.

THE comparison of districts in which the legal duties of registrar are performed, with those in which they are neglected, affords no ground for believing that the mere keeping of the “register of successful vaccination,” serves any useful purpose as a means of promoting vaccination. There is, however, good reason for supposing that the delivery of the notice is not without its utility, even when no other agency for the purpose is in operation. In those districts in which an active supervision of vaccination is maintained the notice is often employed as a means of communication between the registrar and contractor ; the parent being instructed on receiving it, at once to transmit it to the latter, who is thereby informed of the birth, and is enabled to arrange for the vaccination.

It may, however, be generally stated that throughout the unions to which this inquiry relates, the very important influence exercised in certain cases by the registrar in furtherance of vaccination, is dependent, not on the due performance of his regular duties, but on the assumption by him of functions other than those prescribed by law. Thus, in the union of Bury St. Edmunds, which constitutes but one registration district, a system has been adopted which, although complete and effectual, is not in accordance with the instructions of the Registrar General.

On delivering the notice of the requirement of vaccination to the parent, the registrar enters the minute of such delivery in a book kept for the purpose (“minute book”). The headings of this book are identical with those in the “Register of Successful Vaccination” with the exception that the columns for the entry of the minute of delivery of notice and of the name of the certifying practitioner are omitted and a single column headed “certificate” substituted. Whenever the registrar fails to receive within a reasonable time after the expiration of three months from birth the duplicate certificate of the vaccination of any child, he at once proceeds to make inquiries ; in case the result of such inquiry should be unsatisfactory he delivers to the parent a personal notice requiring him to have the child vaccinated, and in default, lays an information. The result of the inquiry in each case is entered in the “minute book,” under the heading “certificate,” the term of entry being “vaccinated,” “dead,” or “removed,” as the case may be. The entries of all vaccinated children are copied from the “minute book,” into the “register of successful vaccinations,” which in this union is in reality what its name denotes, and not a useless transcript of the register of births.

Legal functions of registrar in respect of vaccination ; the due discharge of those functions conduces but little to the promotion of vaccination, excepting as an aid to efficient supervision. They become however, of great importance when the registrar is willing to assume in addition to them, that of inquiring into all cases of infringement of the vaccination laws. Irregular, but efficient performance of the duties of registrar at Bury St. Edmunds.

## APPENDIX.

The following is a summary of the entries in the minute book in the years 1858-60.

II. Local  
inquiries as to  
Vaccination.

3. Essex and  
part of Suffolk.

Births	-	-	1231
"Vaccinated"	-	-	1094
"Dead"	-	-	132
"Removed"	-	-	67
"Refused"	-	-	1

It will be noticed that the sum of the entries under the four heads exceeds the number of the births by 63. This difference expressed the number of children vaccinated, but not born in the union; so that the accession to the vaccinations of the town by immigration, was about equal to the number removed without being vaccinated. We have here a perfect registration of vaccinations, every birth being accounted for. Nearly as satisfactory results were obtained in two of the rural districts, Wickhambrook and Hartest. The registration district of Hartest includes the vaccination district of Hartest and the greater part of that of Cavendish. The arrangements for vaccination, although not conformable with the schedules of the contracts, are regularly and systematically carried out. As at Bury, the registrar inquires into every case of neglect, and informs the parents of the times and places of meeting for vaccination appointed by the contractors. The working of the system is so satisfactory, that in five years I found only twelve entries incomplete, and more than 98 per cent. of the vaccinations were infantile.

Registration  
Hartest (Sud-  
bury);

and Wickham-  
brook (Ris-  
bridge).

In the vaccination districts of Wickhambrook and Great Bradley, which are for the most part comprised in the registration district of Wickhambrook, one of the contractors visits from house to house for vaccination; the other vaccinates applicants weekly at his surgery. Neither of them "solicit" vaccination cases, but the registrar maintains so diligent a supervision of his district, that in four years I found only five cases unaccounted for. Certificates had been received for 96 per cent. of the births. Both of the registrars last referred to are relieving officers.

Public vacci-  
nation in large  
towns.

Ipswich.

The conditions under which public vaccination is carried on in large towns, such as Ipswich, Colchester, Bury, and Stratford, differ materially from those which exist in country towns and rural districts.

In Ipswich (Population in 1861, 377,880) the proportion of vaccinations during the three years, 1858-60, was 56.7 to every hundred births. In the schools, the per-centage of children without trace of vaccination varied from 12.6 to 18.6. The annual numbers of vaccinations performed in the three years referred to, were severally 505, 773, and 815; the increase of the last year being mainly due to the advent of smallpox. The defect of vaccination in the town may be attributed to the inefficiency of the arrangements, and to the absence of all measures of supervision. The union is divided into three districts for vaccination as well as for medical relief, to each of which two vaccinators are appointed. Almost the whole of the vaccination is, however, performed by the medical officers, of whom two vaccinate applicants at their surgeries only, while the other two also visit from house to house. Of the latter, one officiates only in his own district, the other "solicits" vaccination cases throughout the union.

Colchester.

In the town of Colchester, the annual number of vaccinations during the years to which the inquiry relates, was one-half of that of the births. But only one in ten of the children were unscarred; so that the indications afforded by the rates were not confirmed by the examination of the schools. In this union, as at Stratford (see p. 94), the office of public vaccinator has been thrown open to all practitioners,

Stratford-le-  
Bow, see p. 94.



the only requirement or condition being that the contractor shall attend weekly at his surgery. This measure has exercised a more injurious influence in Colchester than in West Ham. Vaccination has been undertaken, not as a public duty, but as a convenient adjunct to private practice; hence great irregularity has resulted both as to the times and places of its performance, some of the practitioners canvassing for cases in all parts of the town, others reprobating the vaccination of any except the children of their private or district patients. None of the registrars attempt to exercise any surveillance of vaccination; the arrangements in force would render it difficult, if not impossible. It may be added that the records of vaccination are very irregularly kept, and consequently the returns are unworthy of dependence.

APPENDIX.

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 II. Local inquiries as to Vaccination.

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 3. Essex and part of Suffolk.

## VI. QUALITY OF VACCINATION.

TABLE II.—SHOWING the NUMBER of CHILDREN EXAMINED in each of 27 Unions and the NUMBER and QUALITY of the CICATRICES of VACCINATION.

Name of Union.	Total.	None.	Doubt- ful.	Typical.*				Passable.				Bad.				With Marks of Smallpox.				
				4.	3.	2.	1.	4.	3.	2.	1.	4.	3.	2.	1.	None	Doubt- ful.			
Billericay	422	46	1	30	77	114	74	5	23	22	14	0	4	2	10	—	—	—	9	—
Braintree	336	44	3	60	46	56	31	13	25	25	6	4	2	10	11	—	—	—	3	—
Chelmsford	837	116	3	44	188	207	124	16	36	44	24	1	7	14	13	—	—	—	7	—
Colchester	723	75	6	64	142	125	55	48	76	68	17	7	11	22	7	—	—	—	3	—
Dunmow	485	45	5	14	72	115	80	4	14	56	28	0	8	20	24	—	—	—	3	—
Epping	486	70	6	23	98	117	43	4	31	27	17	8	8	18	16	—	—	—	1	—
Halstead	527	105	10	65	89	88	57	21	20	31	14	1	4	16	6	—	—	—	1	—
Lexden and Winstree	686	64	5	111	75	101	64	45	68	73	30	1	7	24	18	—	—	—	1	—
Maldon	573	95	8	43	75	82	43	33	37	59	37	2	15	17	27	—	—	—	1	1
Orsett	227	15	0	13	21	71	40	19	10	16	9	0	2	2	9	—	—	—	1	—
Rochford	353	100	9	20	25	51	36	3	14	50	22	3	2	7	11	—	—	—	1	—
Romford	871	40	5	114	122	292	118	16	30	66	40	4	4	12	7	—	—	—	1	—
Saffron Walden	620	89	5	30	97	142	123	3	22	65	26	0	4	8	6	—	—	—	3	—
Tendring	627	99	6	55	103	159	57	24	37	42	11	2	5	13	14	—	—	—	7	—
West Ham	1,753	94	19	149	363	392	236	37	107	145	92	8	28	37	46	—	—	—	12	1
Witham	705	152	4	83	94	109	52	39	41	62	38	3	7	11	10	—	—	—	2	—
Bosmere	321	56	1	37	47	87	43	6	6	20	12	3	0	1	2	—	—	—	4	—
Bury	966	166	13	60	148	214	135	16	43	73	42	5	12	19	20	—	—	—	3	—
Cosford	712	48	2	108	121	175	110	21	36	55	21	4	5	8	8	—	—	—	1	—
Hartismere	311	44	5	12	62	95	54	2	5	15	12	0	1	2	2	—	—	—	1	—
Ipswich	1,379	213	15	127	228	284	159	34	70	109	82	7	11	24	16	—	—	—	65	—
Mildenhall	226	20	3	3	48	69	55	1	4	9	6	0	3	4	1	—	—	—	—	—
Samford	148	29	0	31	25	15	17	4	8	8	6	1	0	1	3	—	—	—	—	—
Stow	348	47	4	25	32	116	40	17	16	31	9	1	0	6	4	—	—	—	—	—
Sudbury	411	59	5	79	84	64	34	7	25	34	5	1	1	7	5	—	—	—	1	2
Thingoe	402	49	2	40	45	120	54	8	28	30	8	3	4	5	6	—	—	—	—	—
Woodbridge	438	95	6	37	68	98	51	8	14	20	11	0	5	12	12	—	—	—	2	—
Totals	15,903	2,075	151	1,477	2,595	3,558	1,985	454	846	1,255	639	69	162	322	314	0	2	2	7	4

\* This and the following columns are to be read thus :—Of those who had typical marks, 30 had 4 marks, 77 had 3 marks. &amp;c.



THE quality of vaccination in any district could be directly determined only by its results as seen in the scars on the arms of children vaccinated. Indirectly, it could be inferred from the arrangements actually in operation, and the mode of vaccination known to be employed.

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Classification of cicatrices : distinctions on which it is founded.

The results of vaccination observed in the examination of children attending elementary schools have been recorded in respect of the number of the cicatrices (between which and the degree of protection afforded there has been shown to be a constant relation) and their resemblance to those which are produced when vaccination has been performed in the most effectual manner. In pursuance of the inquiry the prevailing number of cicatrices resulting from the operations of each vaccinator has been determined, and their character estimated according to their conformity with the "signs of successful vaccination," described in the "Instructions for Vaccinators under Contract." Under the heading "typical," all those scars have been classified, which exhibit a cicatrix which is slightly depressed and "indented with minute pits," without reference either to size or regularity of general contour, excepting in so far that scars having a less diameter than a quarter of an inch have been excluded. Although, however, no attempt has been made to represent unusual *size* of scar numerically, its character has been noted as being probably of similar importance to *number*. It has been considered that the normal diameter of a cicatrix produced by a single insertion is one-third of an inch ; that scars of larger measurement are generally of double or multiple origin ; and that their protective value ought to be estimated according to their area. The same distinctions have been borne in mind in relation to irregularity of contour. Scars resulting from single insertions (as in the ordinary method of puncture) are notably uniform. Irregularity in this respect indicates that the progress of the vesicle has been irregular ; but in scars produced by several contiguous insertions, no such inference is admissible. Those cicatrices only have been designated bad, which would not have been recognized at all as products of vaccination unless they had exhibited the usual arrangement, and had been found in the situation in which vaccination is ordinarily practised. Such scars cannot be accepted as evidence that the child has passed through the vaccine disease at all.

In some of the districts no schools could be examined ; in some the contractors had been so recently appointed, that the results of his work could not be observed ; in others the numbers were so small as not to afford a reliable criterion. In general, those observations only were applied as a test of the quality of vaccination, which were made in schools containing children who had been vaccinated exclusively by the contractor of the district.\*

The results of examinations of schools were sometimes inapplicable.

In several districts it was found that the quality of vaccination was not only expressed in the proportions of good and unprotective scars relatively to the whole number of children having scars, but that the number of those in whom no marks whatever could be detected must also be taken into account, as comprising many cases in which vaccination had been attempted or performed in an ineffectual manner. This was particularly the case in districts in which dry lymph was inserted by the ordinary method of puncture. When the practice of scratching is employed, even fruitless vaccinations appear to leave permanent traces, and children who would in the other case be registered as unscarred, exhibit bad marks.

In certain badly vaccinated districts a large proportion of the children without scars, had been ostensibly vaccinated.

\* When a school contained children not vaccinated by the contractor, such children were sometimes requested to stand aside, and were examined separately.

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Of the whole number in each district in whom scars of vaccination could be discovered, the number per cent. in which they were such as to indicate good vaccination, varied from 84·4 to 17·9. The corresponding per-centage of those in whom mere traces of vaccination were observed, varied from 1·2 to 56·8. These proportions afford ready and reliable criteria of the relative quality of vaccination in the several districts to which they are applicable. Thus, in the following twelve districts the per-centage of good results was above 6·3, and that of bad results varied from 1·2 to 18·8.

Districts which appeared from the proportion of good and bad results, to be worst vaccinated.

Name of District.	In 100 Children examined.		In 100 Children having Marks.	
	Having Marks.	No Marks.	Good.*	Bad.*
Barking - - - -	98·1	1·9	84·4	1·2
Nayland - - - -	88·3	11·7	80·0	3·8
Boxford - - - -	93·2	6·8	77·0	7·3
Barrow - - - -	98·4	1·6	75·8	1·6
Bradwell - - - -	68·7	31·3	71·8	4·3
Walsham - - - -	86·9	13·1	69·0	5·3
Mendlesham - - -	84·8	15·2	67·3	9·8
Horningsheath - -	92·7	7·3	65·9	4·2
Ilford - - - -	96·5	3·5	64·4	6·9
Chelmsford - - - -	84·9	15·1	64·4	18·8
Halstead - - - -	69·3	30·7	64·2	13·8
Harwich - - - -	81·4	18·6	63·4	9·2

It is observable in the above series, that the numbers of well and ill vaccinated are generally in inverse relation to each other; but that there is no relation whatever between the number of those having marks and the quality of the results. The districts of Nayland, Bradwell, and Halstead are the most striking instances.

Districts which appeared on the same grounds to be the best vaccinated.

Name of District.	In 100 Children examined.		In 100 Children having Marks.	
	Having Marks.	No Marks.	Good.	Bad.
Southminster - - -	88·2	11·8	17·9	56·8
Barton - - - -	77·3	22·7	26·7	16·7
Rochford - - - -	71·5	28·5	31·4	20·0
Thaxted - - - -	85·4	14·6	34·5	20·6
Epping - - - -	82·6	17·4	35·1	22·0
Rayleigh - - - -	65·4	34·6	36·4	31·8
Aveley - - - -	81·6	18·4	36·8	31·6
Dedham - - - -	88·9	11·1	37·5	23·1
Kelvedon - - - -	74·7	25·3	41·5	23·4
Hornchurch - - - -	99·2	0·8	41·9	18·8
Dunmow - - - -	92·2	7·8	42·7	2·0
Maldon - - - -	85·0	15·0	43·5	13·3

\* For the purposes of comparison and generalization, the two elements of quality and number may be combined as a basis of classification; the cases recorded may be divided into (1) those in which two or more typical cicatrices were found—Good Vaccination; (2) those in which one typical or two or more passable were observed—Indifferent Vaccination; and (3), those which exhibited one passable or any number of bad cicatrices—Bad or Unprotective Vaccination. In this and the following Table, the terms “good” and “bad” are used in the senses above stated.



The Tables show, that in the great majority of the districts, two was the prevailing number of cicatrices; in the following in which the aggregate of good results was scarcely above the average the number of instances in which three or four scars were observed, gave them a claim to be considered as well vaccinated, viz., Bergholt, Bildeston, Braintree, Colchester, Colne, Dunmow, Easter, Epping, Hals-tead, Maldon, Manningtree, Stratford St. Mary, Sudbury. In sixteen other districts remarkable regularity and uniformity were noted in those results which were recorded as typical, viz., at Braintree, Barrow, Baylham, Bradwell, Debenham, Debden, Dunmow, Eye, Layer-de-la-Hay, Manningtree, Mendlesham, Newport, Nayland, Ockendon, Stanford, Thoydon Garnon, Walsham. It will be noticed that some of these districts are included in the list of those in which the per-centage of good results was exceedingly low. This apparent inconsistency arises from the fact, that the schools in which the observations were made included the work of several vaccinators.

The quality of vaccination is dependent on (1) the arrangements in actual operation, (2) the state and quality of the lymph employed, and (3) the manner in which it is inserted.

Arrangements can only affect the quality of vaccination, in so far as they insure or prevent the use of lymph derived directly from the arm. Their influence in this respect may be illustrated as follows:—Of twenty-one contractors who professed to vaccinate with dry lymph exclusively, eighteen also stated that they vaccinated entirely from house to house, each operation being separately performed. Of thirty-nine contractors who stated that they always vaccinated from arm to arm (unless when receiving supply-points from the National Vaccine Institution), only six had adopted the domiciliary plan.†

Dry lymph, stored on points, is used exclusively in the following nine districts:—Aveley, Barton, Bury, (Nos. 1, 2, and 3), Holbrook, Ingatestone, Rayleigh, Rochford. Four of these districts have been already enumerated among those in which the proportion of good results was smallest. In the town of Bury it has been already seen that, numerically, the population is completely vaccinated; but the examination of the schools afforded evidence of defective quality. Large proportions of children were met with in all of the schools, in whom either no cicatrices could be discovered, or those observed were

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The prevalent number of cicatrices was two in most of the districts: exceptions.

Districts in which the cicatrices were remarkably characteristic and regular.

Causes by which good or bad quality of vaccination is determined.

Arrangements.

Lymph: ‡  
Districts in which dry lymph stored on points is used.

Bad vaccination at Bury St. Edmunds.

† These exceptions must be regarded rather as referable to inconsistencies of statement than as real facts. In some districts I have been informed positively that children are never brought together for vaccination, or that vaccinations are never performed in groups. In other instances it has been difficult, in conferring with vaccinators, to give prominence to the important distinction between domiciliary vaccination in the strict sense and that more usual plan which consists in assembling several infants in one cottage, and is frequently called house to house vaccination.

‡ As regards the lymph employed in vaccination, 39 out of 141 public vaccinator conferred with, stated that they always vaccinated from arm to arm; 35 stated that they did so usually, 25 frequently, 10 rarely, and 2 very rarely. Two stated that they adopted the practice during vaccination periods, and one that he did so as regards his town patients exclusively.

Of the same number of vaccinators, 102 stated that they employed in vaccination recent lymph (that is lymph taken from the arm not more than 24 hours before use) conveying it from house to house by various methods. Of these, 76 use points, 4 use capillary tubes, 11 use glasses, 5 use the vaccine bottle, while 6 employ several of these methods.

Preserved or stored lymph is employed by 78 vaccinators; of these, 49 keep their lymph on points, of whom 10 preserve such points in air-tight bottles, 5 in oiled silk or otherwise, while 34 have recourse to no systematic method. Tubes are used for storage by 12 vaccinators, glasses by 8, and bottles by 5. Four employ two methods



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of so imperfect a character as to afford no ground for supposing that vaccination had been effectually performed. In a hundred children examined, 83 per cent. only had marks of vaccination; in 52 per cent. of these, the results were good, and in 15·5 per cent. they were bad. From the facts already stated it is evident that, in most of the instances in which no marks could be discovered, vaccination had really been attempted.\* The prevalent number of cicatrices in all of the schools examined was two; but in one school, attended by children in a higher social position than the rest, few of whom had been publicly vaccinated, a better quality of vaccination was indicated; the number of those who exhibited four or more typical scars being four times as great, and the proportions per cent. of those having bad and no marks being severally 3·6 and 11·9, instead of 15·5 and 17·2. It will be seen from the table that the vaccinators of the first and third districts employ dry lymph, and vaccinate at their surgeries at indefinite times.

Barton  
(Thingoe.)

In the school at Barton, a rural district which is held by the contractor of the third district of Bury, 22 per cent. of the children exhibited no traces of vaccination. The imperfect cicatrices are noted as being "faint, hardly traceable white patches." Here, also, several children who stated they had been vaccinated, showed no marks. In the schools at Ingatestone the proportions of good and bad results were severally 36·5 and 3·4. It was noted that the scars were usually of irregular character. In the schools at Rochford it is recorded that "bad or irregular cicatrices were met with in a large proportion of instances." Only 31 per cent. of the results were good; most of the children only exhibiting one scar of vaccination. In the neighbouring district of Rayleigh the quality of the cicatrices was even worse; but the dominant number being two, the proportion of good results recorded was somewhat larger.

Ingatestone  
(Chelmsford.)

## Rochford.

Rayleigh  
(Rochford.)

The general quality of vaccination was always bad in districts in which dry lymph was exclusively used; good results may, however, be obtained with proper precautions.

Use of points  
for conveyance  
of lymph.

By comparing the last with the preceding paragraphs it will be found, that in selecting those districts in which dry lymph is exclusively used, we have, in fact, selected those in which vaccination is in every respect worst performed. No instances have been met with in which the exclusive use of dry lymph preserved on points has led to a satisfactory state of vaccination, partly, perhaps, because no such plan would be adopted by a careful vaccinator. I have, however, had the opportunity of satisfying myself, that perfectly good results *may* be obtained with such lymph, provided that it be kept for very short periods, not exceeding one or two days, or that if this limit be exceeded, proper precautions be used in preserving it. Good cicatrices obtained by dry stored lymph were observed in the districts of Chingford, Chesterford, and Walsham-le-Willows. In examining the schools in the last-mentioned district, with special reference to the mode of vaccination, I found that the cicatrices were characteristic, remarkably few of them being imperfect, and that the prevalent number was equal to that of the insertions. I had the opportunity of examining the points employed, which were well charged and carefully preserved. In those districts in which capillary tubes have not been introduced, the use of points, for the purpose of carrying lymph from house to house, is very general among contractors. I have seen no reason to infer that the practice is unfavourable to good vaccination, excepting in so far as it may lead to the employment of

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\* In the course of these examinations it frequently happened that children without marks stated that they had been vaccinated; occasionally the certificate of the contractor was produced.



dry lymph for other purposes. It prevails in many of the best vaccinated districts that I visited. APPENDIX.

Of the thirty-nine districts in which it was stated that vaccination was performed entirely from arm to arm, three only are among the twelve in which the numerical relations of good and bad results were most favourable, viz., Bradwell, Ilford, and Boxford. Of the remainder, six have been enumerated above among those in which the prevalent number of cicatrices was largest. In two others, although the proportion of good cicatrices was small, they were remarkably characteristic; so that there is evidence of good quality of vaccination in eleven districts, while three of them, Hornchurch, Dedham and Thaxted, are in the list of those which appear from the relative proportions of good to bad results to be the worst vaccinated; but in Hornchurch the imperfect cicatrices were found to be the work of another practitioner. II. Local inquiries as to Vaccination.

The practice of conveying and storing lymph in stoppered bottles was adopted by seven of the contractors. Lymph so stored is supposed to be kept liquid, and in order to conduce to this result it is sometimes mixed with glycerine. Glasses are used for keeping lymph by eight of the contractors; in two of their districts the results were remarkably good. I have made no observations which lead me to infer that either of these practices is detrimental to the quality of vaccination; they are, perhaps, applicable for the conveyance of moist lymph from house to house, but are objectionable as methods of storage. 3. Essex and part of Suffolk.

The capillary tubes of Dr. Husband have been, as yet, introduced into few districts; I found that they were used occasionally and for the purpose of storage only, by five of the contractors; seven others employed them both for storage and conveyance. As regards two of these districts, the results have been carefully determined, large schools having been examined in each. In Hadleigh (Suffolk) the method is very completely carried out. Capillary tubes were introduced about three years ago, since which period the contractor has constantly employed them, and finds no inconvenience or difficulty attending their use. Although his district is partly rural he is enabled to vaccinate at any time or place, and thus to combine the advantages of domiciliary with those of stational vaccination. Through the kindness of this gentleman in arranging that a number of vaccinations should be performed eight days previously to my visit, I had the opportunity of observing the vesicles produced by lymph which had been preserved in tubes during various periods; all of these exhibited satisfactory characters. The cicatrices observed in the schools were characteristic. Of 100 children having marks of vaccination 52·4 exhibited good results, and 11·1 bad results. In the district of Barking, the whole of which is urban, the capillary tubes have been employed with perfect success for some years; the excellence of the results shows that they are no less applicable to an urban than to a rural district. In other districts the practice is of such recent introduction that no information could be obtained by the examination of the schools. Conveyance of liquid lymph in stoppered bottles. or between glasses.

Of the 139 contractors who were conferred with, it was found that 104 insert by the ordinary method of puncture, six by making numerous very minute valvular punctures in close proximity for each intended vesicle; seven adopt the practice of making a single long scratch for each insertion, while twenty-two abrade the cuticle, either by scraping it off with the lancet used as an eraser, or by making an immense number of minute scratches over a very limited area, and as close together as possible. These scratches may be either parallel to each other, or crossed in two, or any number of directions. Capillary tubes: success with which they have been introduced in some districts. Hadleigh (Cosford,) Barking.

Mode of insertion.



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By several punctures.

By a single long scratch.

By numerous contiguous scratches or by abrasion.

By vesication.

Causes of quantitative and qualitative defect of vaccination.

The plan of making numerous punctures for each intended vesicle is employed by several of the most successful vaccinators; the cicatrix which results is usually above the normal size, especially if the several punctures extend over a large area. In the district of Clavering it is the practice of the contractor to make several separate punctures at so short a distance from each other that the vesicles become confluent; the resulting cicatrices are of large size, but irregular form, and occur either in twos or singly.

The insertion of lymph by a single scratch with a keen lancet held vertically has appeared to present great advantages, particularly when it is necessary to employ dry lymph; it having been found, that in this case, the chances of failure are thereby much diminished. The cicatrices are oval and almost always above the usual size. At Eye and at Stratford it was observed that some of them were stellate and excavated, resembling the scars of a burn. Such appearances have been noticed under other circumstances, but occur most frequently when this method of insertion has been employed. Very satisfactory results were observed in the district of Nayland, which stands second to that of Barking only in respect of the quality of vaccination. Not only were the cicatrices remarkably characteristic, but in 52 per cent. of the scarred children in the schools, the number of typical marks was four or more.

The twenty-two districts in which the various methods of abrasion are practised, include several in which the quality of vaccination is notably bad; others in which good results were recorded, *e.g.* those of Debden, Chesterford, Dunmow, and St. Margaret, Ipswich. In several of these districts the cicatrices were recorded as remarkably regular; but they did not differ in any respect from those produced by puncture.

In the district of Alderton the contractor in commencing his yearly vaccination from points supplied by the National Vaccine Institution, inserts them below the epidermis, raised by the previous application of a very small blister. He adopts this plan only when he has occasion to use preserved lymph.

## CONCLUSIONS.

From the preceding statements relating to the quantity and quality of vaccination in the unions inspected, it may be inferred:—

First, that wherever the practice of vaccination is most general, its diffusion may be traced to the energetic carrying out of measures of supervision, either by the contractor, the registrar, or both.\*

Secondly, that numerical completeness of vaccination may be attained under every variety of method and arrangement; but the most satisfactory results (particularly as regards the number of infantile vaccinations) may be expected when meetings for vaccination are appointed

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\* In certain districts it was found that such supervision was advantageously exercised by the registrar without the direct co-operation of the contractor. In others it was maintained with equal success by the contractor himself; but it appeared that this result could only be attained when information was regularly and periodically furnished by the registrar in the form of lists of children requiring vaccination. It was found that in the absence of such information, the utmost zeal on the part of the contractor and the best arrangements failed to produce numerical completeness of vaccination; the only exceptions occurring where the medical officer from long residence had become personally acquainted with every inhabitant in his district.



at intervals of time not exceeding six months, nor less than three months.\*

Thirdly, that bad vaccination is almost always directly dependent on the careless employment of improperly preserved dry lymph.†

Fourthly, that bad vaccination is usually indirectly associated with irregularity of inspection, in consequence of which the vaccinator remains unaware of the number and extent of his failures, and loses the advantages of experience.

Fifthly, that, both as regards facility of arrangements and quality of result, the use of the capillary tubes of Dr. Husband affords considerable advantages to the public vaccinator, especially if his district be rural : first, because it furnishes him with an efficient means of maintaining his supply without having recourse to extraneous sources, and thus enables him to dispense altogether with the use of points : secondly, because in thinly populated neighbourhoods, in which experience shows that it is impossible to assemble all the children at the station, it enables him, with equal advantages, to vaccinate from house to house.

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3. Essex and part of Suffolk.

## VII. PREVALENCE OF SMALLPOX.

Smallpox has not prevailed epidemically in any of the unions inspected, excepting Romford, Chelmsford, and Ipswich. At Romford cases occurred from June 4th to October 1859, during which period seven deaths from this cause were registered. Both at Chelmsford and Ipswich, the disease broke out in the month of July 1860, and continued to prevail until the spring of 1861.

At Chelmsford, the first case was that of a vagrant who came into the town labouring under the disease. The next person attacked was a lodger in the same house, from which as a centre it extended to the neighbouring streets; about 50 cases occurring in a short period. In the course of the autumn it found its way to other parts of the town.

The diffusion of the disease appears to have been favoured not only by the neglect of vaccination, but by the bad sanitary condition of those streets which are inhabited by the poor; and above all by the absence of any provision for the removal of infected persons, the guardians having refused to allow their admission into the workhouse. The worst cases occurred among the vagrant population, many of whom were living in circumstances of great destitution in crowded lodging-houses. In one instance the disease invaded a family of 9 individuals of all ages, inhabiting one of the caravans in which such persons pass their migratory existence. When first seen by the medical officer, the dead and dying were huddled together in that wretched tenement, and there, on the roadside, he was obliged to continue his attendance; there was no place to receive them, and such was the popular terror, that no nurse could be found to wait on them.

On the 26th of July, a youth aged 16, who had not been vaccinated, was admitted into the workhouse apparently well; the symptoms of small-pox appeared on the 4th day after his admission. Six of the inmates of the same ward were eventually attacked, in two of whom

\* In making such appointments, it is of importance that times should be selected which will interfere, as little as possible, with the agricultural operations of the district.

† Admitting that with due precaution, both in the performance of the operation and in the collection and storage of such lymph, it may be used with perfect success, it is no less true, that, in ordinary hands, this method leads to uncertainty of result, and consequently to bad vaccination.

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the disease did not manifest itself until they had returned to their homes, where, in each case, the disease was communicated to several persons. Five other inmates of the workhouse were attacked, of whom one died.

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## 3. Essex and part of Suffolk.

## Ipswich.

At Ipswich the prevalence of smallpox was much more extended than in Chelmsford. I have not been able to obtain any information as to its introduction. It appears, however, that although scattered cases occurred during the months of July and August, 3 of which were fatal, the disease did not become general until September; it attained its greatest prevalence in that month, slowly declining during October, November, and December, but not disappearing until April. In all, 22 deaths were registered in 9 months, of which 1 occurred in July, 2 in August, 7 in September, 4 in each of the following months; 2 in December, and 2 in the first quarter of 1861. The number of persons attacked can only be conjectured; it must have amounted to several hundreds. The epidemic has left its mark on the population; numbers of disfigured persons are met with in the streets, especially in those parts of the town in which it was most prevalent. In the schools 68 children were found pitted with small-pox. Of these 65 had no traces of vaccination; 2 had one scar, and one had two.

From Ipswich, smallpox was introduced by infected persons (often vagrants) into the following districts, viz.; Holbrook, (Samford), Claydon, Needham, and Coddendam, (Bosmere and Claydon), Grundisburgh and Charsfield, (Woodbridge), Mendlesham and Botesdale (Hartismere). At Charsfield it extended to eight residents, one of whom had not been vaccinated; at Mendlesham three persons in the same family were attacked, and at Holbrook one person. In the other instances there was no diffusion of the disease.

## 4. Norfolk and part of Suffolk.

## 4. DR. BUCHANAN'S Summary of the Results of his Inquiry in NORFOLK and part of SUFFOLK.

*Amount of Vaccination.*

## Amount of vaccination.

THE returns of public vaccination at all ages, in England at large, during the past few years, have shown with some regularity a number of vaccinations close upon 70 per cent. of the registered births. This per-centage is observed to be considerably augmented when smallpox exists in a district, both from arrears of vaccination being then made up, and from the larger number of secondary or re-vaccinations that are done at such a time. The per-centage is also higher in those districts (for the most part the purely rural ones) where there is little or no vaccination by private practitioners. In the 27 unions visited, the amount of public vaccination as compared with the births in recent years (1858, 1859, 1860) is shown in the following table, where the unions are arranged according to the proportion of infantile vaccination done in each. Index letters are placed against each union, where the amount of public vaccination has been notably influenced by one or other of the disturbing causes here adverted to.

## Amount of public vaccination in 1858-1860.



TABLE A.—Amount of Public Vaccination in 27 Unions.

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No.	Union.	Vaccinations per cent. of Births in three years, 1858, 1859, 1860.		II. Local inquiries as to Vaccination.
		Under One Year.	Total Vaccination.	
1	Wayland - - -	77·0	95·6	4. Norfolk and part of Suffolk.
2	Freebridge Lynn ( <i>c</i> ) - - -	49·7	73·8	
3	St. Faith's - - -	49·5	77·5	
4	Thetford ( <i>b, c</i> ) - - -	48·7	92·8	
5	Forehoe ( <i>a, c</i> ) - - -	45·0	77·8	
6	Downham ( <i>b, c</i> ) - - -	44·2	85·0	
7	Aylsham - - -	43·5	64·0	
8	King's Lynn ( <i>aa, b, cc</i> ) - - -	42·9	67·5	
9	Walsingham ( <i>a, c</i> ) - - -	41·4	57·6	
10	Blything ( <i>b, c</i> ) - - -	39·3	68·4	
11	Wangford ( <i>aa</i> ) - - -	37·6	69·0	
12	Blofield ( <i>a</i> ) - - -	36·9	71·1	
13	Docking ( <i>b, cc</i> ) - - -	35·2	109·2	
14	Henstead - - -	35·0	50·7	
15	Swaffham ( <i>c</i> ) - - -	33·3	68·7	
16	Plomesgate - - -	33·0	53·5	
17	Mitford and Launditch ( <i>c</i> ) - - -	31·8	78·0	
18	Yarmouth ( <i>aa, b, c</i> ) - - -	30·8	49·0	
19	Loddon and Clavering ( <i>c</i> ) - - -	30·1	64·8	
20	Erpingham ( <i>bb, cc</i> ) - - -	29·1	64·4	
21	Norwich ( <i>aa, cc</i> ) - - -	28·8	50·0	
22	Depwade ( <i>u, b</i> ) - - -	26·4	48·6	
23	Tunstead and Happing - - -	24·2	45·9	
24	Flegg, East and West - - -	22·4	46·4	
25	Hoxne ( <i>b, c</i> ) - - -	21·5	56·4	
26	Guiltecross - - -	20·2	36·1	
27	Mutford and Lothingland ( <i>aa, c</i> ) -	16·8	52·1	

(*a*) Signifies there is a notable amount (*a* and *aa* less and more) of private vaccination in the Union.

(*b*) Signifies that some number of re-vaccinations (*b* and *bb* less and more) are included in the total vaccination.

(*c*) Signifies there has been enough smallpox (*c* and *cc* less and more of it) to give an impetus to vaccination in the course of the three years.

From this table it will be observed that in only one union (Wayland) out of the 27, have half the children been vaccinated by the public vaccinator within a year of their birth, even although the presence of smallpox has in other unions given an impetus to vaccination. And it will be seen that, in districts where private vaccination is inconsiderable, the proportion of public vaccinations to births has fallen so low as one child only vaccinated in infancy to every five that are born. Thirdly, it will appear that the largest and the smallest amounts of infantile vaccination have actually been found in two unions adjacent to each other (A 1, and A 26.) The total amount of public vaccination will also be found to have borne no constant relation to the amount of infantile vaccination; in some unions the vast majority of vaccinations are of infants, while in others the half are of children more than one year old; and this when there is no making up of arrears.

The returns of public vaccination, however, especially for a limited number of years, cannot be depended on for a true estimate of the amount of vaccination in the unions. It is probably intended by the legislature that the books kept by the Registrars of births and deaths should supply information as to the total amount of vaccination, public and private,

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4. Norfolk and part of Suffolk.

Total amount of vaccination, as seen in schools.

in each district. In practice, however, these books commonly fail altogether in this respect. The best available gauge of the quantity of vaccination actually performed in a district I have found in an examination, according to my instructions, of the children themselves in elementary schools. In an aggregate of 15,041 children thus examined, 2,988 were unvaccinated, or their vaccination was doubtful.\* This is very closely 20 per cent. (19·87), or one child unvaccinated out of every five examined. The number of children examined in each union, and the per-centage of unvaccinated among them, is shown in the following.

TABLE B.—Unvaccinated Children in Schools of 27 Unions.

No.	Union.	Children examined.	Unvaccinated and doubtful, per cent.
1	Wayland - - -	282	12·1
2	Wangford - - -	751	12·1
3	Downham - - -	288	12·8
(a) 4	Forehoe - - -	107	13·0
5	Yarmouth - - -	1,084	13·8
6	Flegg, East and West - -	299	14·3
(a) 7	Swaffham - - -	204	14·8
8	Plomesgate - - -	505	15·6
9	Blything - - -	954	17·3
10	Deking - - -	285	17·6
11	Norwich - - -	1,757	17·8
12	Aylsham - - -	707	17·9
13	Walsingham - - -	415	18·3
14	King's Lynn - - -	640	18·4
(a) 15	Henstead - - -	95	19·0
16	Erpingham - - -	925	20·2
17	Loddon and Clavering - -	514	20·9
18	St. Faith's - - -	200	21·0
19	Mitford and Launditch - -	480	21·1
20	Thetford - - -	689	22·9
21	Tunstead and Happing - -	478	23·4
22	Hoxne - - -	568	23·6
23	Blofield - - -	353	24·5
24	Depwade - - -	766	28·0
25	Guiltecross - - -	446	28·4
26	Mutford and Lothingland -	801	30·0
27	Freebridge Lynn - - -	448	30·6

(a) In these unions the number of children examined was too small for deductions to be very absolutely drawn.

Even from this table the quantity of vaccination in each union must be inferred with some reservation. The schools examined may not very accurately represent the whole of the children of the union, and an examination of them often gives information as to the past condition of vaccination rather than the present.† However, where a comparison of the two preceding tables gives correspondent results for a union, the recent state of vaccination may be directly deduced. Thus, there can be no doubt that Wayland (A 1, B 1,) is the very best, and that Guilt-

\* Among the 2,988 the vaccination of 184 was doubtful. Cases were not so recorded if any cicatrix could be found, such as a vaccine vesicle would be likely to produce.

† For instance, 12·1 per cent. of children were found unvaccinated in the Wayland Union; yet, of late years, scarcely a child has been left without vaccination. At the time of examination, it was observed that the unvaccinated were chiefly among the elder children.



cross (A 26, B 25,) and Mutford and Lothingland (A 27, B 26,) are the worst, in respect of their numerical vaccination. Discrepancies between the two tables come from (*a*) a notable amount of private vaccination in a district, as in the case of Norwich (A 21, B 11,) and Yarmouth (A 18, B 5); (*b*) from a considerable number of revaccinations being included in the returns of table A. ; this is a source of disturbance of less magnitude. (*c*) Discrepancies arise also from the recent existence of small-pox, which has given to districts, really ill-vaccinated, (table B.) a good position in the returns of vaccination (table A). Freebridge Lynn (A 2, B 27,) and Thetford (A 4, B 20,) are illustrations of this. Again, there are (*d*) other discrepancies in the former amount of vaccination, as shown by the schools, and the recent amount of vaccination done in a union. Of this, Flegg (A 24, B 6,) affords a conspicuous instance in the one direction. St. Faith's (A 3, B 18,) and Blofield (A 12, B 23,) are instances where vaccination has probably of late years been better carried out. On the whole, however, careful examination of the two tables points to a considerable stability in the amount of vaccination in each union.\*

In stating the *causes* that are in operation in these unions to limit unduly the amount of public vaccination, I am anxious at the outset to give ample recognition to the ignorant obstinacy of the poor. On these points all with whom I conferred expressed a strong opinion.

In some localities visited the fables of fifty years ago are barely out of date ; and people affect to ascribe to vaccination diseases of every kind occurring at every period of their child's life. Of real belief in these statements there is, however, very little. It is a much more widely-spread notion among parents that the vaccinator gets some vast advantage from their children, and that they are entitled to some part of it. Very violent " prejudices " are removed on a wholesale scale by penny buns, by beer, by twopence. Such measures have in numerous instances been had recourse to by contractors with a temporary gain, but much ultimate harm to vaccination. On the side of the parents, however, it should be stated that the form of vaccination offered to them is not always that which they like best—from the arm of a child whose pedigree they know ; and also that the singular prevalence of skin diseases, especially scabies, in some districts, has naturally set them to seek for some cause beyond themselves.

Not ignoring then the practical difficulties which arise from the ignorance of a poor population, more especially in agricultural districts (where, as will be afterwards be shown, there is less opportunity for appreciating the protection conferred against smallpox), I have to consider, first, how far the insufficient amount of public vaccination has depended on defective administration, and afterwards, whether there are any difficulties which may be removed by an amendment of the law.

A. As to the share of the Guardians in the administration of the vaccination laws, I have to remark that in some unions they have taken no interest whatever in the subject beyond occasionally remonstrating at the size of a contractor's account. In seven unions there were either no contracts and no arrangements made by the guardians, or else the contracts and the arrangements were obsolete and forgotten. In one of these unions, the proposed contracts had been expressly rejected by

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## 4. Norfolk and part of Suffolk.

Causes influencing amount of public vaccination.

"Prejudices" of the poor.

Influence of the Guardians on amount of vaccination.

\* The following table exhibits the unvaccinated children found in workhouses. Children in all the unions but four some children have been overlooked. It is rarely the practice for children to be duly scrutinized on admission.

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Vaccination.4. Norfolk and  
part of Suffolk.Impracticable  
contract ar-  
rangements.

the Poor Law Board ; and in several districts vaccinators were found to be acting on old contracts made with their predecessors. It is to be observed, however, that districts for which there was no contract were by no means always the worst in their numerical vaccination. On the other hand, in several of the unions (especially some of the best vaccinated) the guardians had interested themselves much about the operation.

Secondly, the arrangements entered into between the guardians and contractors were often of a very unpractical kind. In the rural unions it was an almost universal error that attendances at the village stations were required much too frequently. In two such unions, weekly attendances were required at these stations. Nine unions demanded attendance once a month for vaccination, and again for inspection. Six specified every second month as the period for vaccinating ; and in one rural union only (Loddon, No. 3, District), had the guardians been advised to require three vaccinating periods

TABLE C.—VACCINATION IN WORKHOUSES.

Union Workhouse.		Total children over three months examined.	Unvaccinated Children.			Per-centage of whole who should have been vaccinated, but were overlooked.
			Total.	Protected by Smallpox.	Deferred for sufficient reason.	
0-0 p. c.	Mutford and Lothingland -	47	2	2	0	0-0
	Walsingham -	40	3	0	3	0-0
	Tunstead and Happing -	20	1	0	1	0-0
	Swaffham -	17	1	0	1	0-0
0-10 p. c.	Yarmouth -	72	9	5	3	1-4
	Wangford -	52	2	0	0	3-8
	St. Faith's -	25	3	0	2	4-0
	Norwich -	191	14	6	0	4-2
	Plomesgate -	51	3	0	0	5-9
	Wayland -	30	2	0	0	6-7
	Henstead -	29	5	1	2	6-9
	Downham -	72	5	0	0	7-0
	Mitford and Launditch -	106	11	3	0	7-5
	Hoxne -	65	5	0	0	7-7
	King's Lynn -	102	10	2	0	7-8
	Docking -	38	3	0	0	7-9
	Forehoe -	45	4	0	0	8-9
10-20 p. c.	Flegg, East and West -	30	4	0	1	10-0
	Loddon and Clavering -	59	6	0	0	10-2
	Blything -	81	12	2	0	12-4
	Erpingham -	52	8	0	0	15-3
	Depwade -	78	13	0	0	16-7
	Thetford -	41	7	0	0	17-1
	Blofield -	57	10	0	0	17-5
	Guiltcross -	67	12	0	0	17-9
20-30	Aylsham -	53	15	0	0	27-0
	Freebridge Lynn -	42	18	2	0	38-1



only in the year. As a sample of the multiplication of attendances sometimes required, the instance may be cited of a district of 3,000 inhabitants, where, by contract, monthly attendances were required for vaccination and inspection at six stations ; or 144 attendances to vaccinate about 100 children. In two or three rural unions, a single station only was named in each district, on the understanding that the contractor should operate at the houses of the children. This was notably the case in the Blything union, where a special clause was introduced into the contracts requiring the contractor to visit and offer vaccination to all children who were not brought to him.—In small towns, public vaccinators being usually resident in them, the ordinary contract arrangements were for daily or weekly attendance at their surgeries.—In the strictly urban districts of Norwich and Lynn, public vaccination was divided among more performers than was desirable for the full maintenance of the local lymph supply.—Yarmouth did not err in this respect ; but here and at Lynn more than one day in the week was given to the operation.

With two exceptions all the unions, rural and urban, were divided into vaccination districts identical with the Poor Law medical districts, and the public vaccinator was also the district medical officer. The exceptions were, Lynn, an urban, and Erpingham, a rural district. In the former three medical practitioners, and in the latter eleven, held appointments as vaccinators ; but in the Erpingham union the proposed contracts had not been approved by the Poor Law Board.

The degree to which the arrangements of the contracts were carried into practice was found to vary considerably. As for the country unions (although in separate districts contract arrangements were occasionally kept to), in no one union, regarded as a whole, was the public vaccination exclusively done at the appointed stations. The Wayland union was distinctly the highest in the amount of its station vaccination, each of the contractors making it the rule to use his stations (at times fixed by himself and the registrar), and one of them never vaccinating elsewhere, except in very rare instances. It has been shown (tables A. and B.) that Wayland was easily first of all the unions visited in the amount of its vaccination ; a conclusive reply to those who conceive that a system of stations is inapplicable to a rural district. But in this union, vaccination was not performed at the times appointed by the contracts, but only once or twice a year, winter and the harvest months being altogether avoided.\* Where vaccination was, by contract, performed at houses (in the Blything union), the arrangement of the contract was, in the main, adhered to ; but the vaccinators did not regularly comply with the provision of their contracts to report to the guardians all who refused the operation. In the vast majority of the rural districts, however, the arrangements of the contracts were found impracticable, and the appointed places and times were altogether ignored by the vaccinator. It was a very wide-spread belief among guardians that vaccination could only be done in practice from house to house ; and this notion was shared by many contractors, who found that with incessant attendances they failed to get children to meet them ; as well as by others, who would dislike to be fixed to any regular time, were it only at two periods of the year. In practice, therefore, the contractor has made for himself new arrangements, consulting his own leisure, and either going from house to house, or else extemporizing a station at some convenient cottage, to which neighbouring children could be brought. In one or other of these ways it

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Division of union.

Adherence to contract arrangements in practice.

Contractor makes own arrangements.

\* In Wangford Union, which stands equal with Wayland in the number of children actually found vaccinated in its schools, the contract stations were also used to a great extent ; and it may be mentioned that in neither of these unions was there any bribery, or employment of public houses as stations.



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has been contrived to get large batches of children vaccinated in the course of a few weeks ; and in the hands of an energetic and methodical contractor, excellent numerical results have been sometimes obtained. However, where this system of procedure has been established, the guardians have ceased to exercise any check on the vaccination of their union, which then comes to depend entirely on the personal devotion of the contractor. Some of the worst vaccinated districts were those of unions where this system had been established, and where the contractor had ceased to exercise, or had irregularly exercised, functions of which he had himself assumed the responsibility.

In the town districts, large and small, the practice of vaccinating at houses was also found to obtain ; and vaccination was not done uniformly throughout the year. In the larger towns some considerable proportion of vaccination was done at the appointed stations ; a few contractors refusing to vaccinate at houses.

In the undivided unions, custom had given to the district medical officer the special right of vaccinating in his medical district all who were in receipt of parish relief. In Erpingham union public vaccination was practically entrusted to one practitioner in the town of Holt, to two in Cromer, and to four in North Walsham. The children in Holt schools showed 7 per cent. unvaccinated, those in Cromer schools 19 per cent., and those in North Walsham 33 per cent. unvaccinated. This is a good instance of how the public vaccination of a locality is diminished in amount when the interest is distributed, and the lymph supply is divided among too numerous practitioners.

Another point which I observed in the contracts with a view to ascertaining its effects on the amount of public vaccination was the rate of payment to the contractors. Nineteen unions paid the ordinary minimum rate prescribed by the Compulsory Vaccination Act, 1s. 6d. under 2 miles, 2s. 6d. above 2 miles from the contractor's residence. Tunstead and Happing union paid a uniform 1s. 6d. for all cases, the contracts not having been subjected to revision since 1853. Hoxne and Walsingham paid 2s. under the two miles, and 2s. 6d. beyond. Docking, Freebridge Lynn, Loddon, and Plomesgate paid a uniform 2s. 6d. whatever the distance ; and Downham Union paid 2s. and 3s. None of the contracts contained special provision for payment for revaccination, and in two if not three instances such payment had been refused. Comparing this statement with the tables showing the amount of vaccination, the deduction may be confidently drawn that the contractors do not allow the rate of payment to interfere with the performance of their duties. It must, however, be confessed that in the union where the rate of payment has been a uniform 1s. 6d., less attention has been paid to distant villages than to those adjacent to the contractor's residence.\*

The qualifications of contractors were found to be satisfactory in all the unions, with one or two partial exceptions referred to in the accompanying notes. In no union had the guardians, by the terms of the vaccination contract or by the endorsement thereof, admitted any

\* Of the workhouses it cannot be so positively said that the manner of payment has no effect on the amount of vaccination, as in some instances workhouse contractors have thought themselves aggrieved at receiving no fees for the vaccination of inmates, and they have even met with remonstrances from their fellow vaccinators for operating without fee on children born in the workhouse, for whom a fee would accrue if vaccination were postponed till the child with its mother had left. Workhouses present the only instance where payment for vaccination is compounded for, and I would submit that the exception is not desirable. To avoid misapprehension, however, it should be plainly stated that in almost every instance the contractor was not aware that there were any unvaccinated children over three months of age in the house.



person to act as deputy to a contractor ; but in twelve unions contractors did in practice perform more or less of their vaccination by deputy. The deputy was sometimes a partner, sometimes an assistant possessing some medical qualification. In seven unions, however, assistants altogether unqualified were found to be employed in vaccination, and in some of these cases there was evidence of their employment being detrimental to the quantity of vaccination in the district.

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Qualifications and deputies.

Notifications.

The other functions of the guardians which affect the amount of vaccination in their union are the giving of notifications and the directing of proceedings for the recovery of penalties. Of the 27 unions eight only have given notifications of their vaccination arrangements with any frequency ; and of these one only (Wayland) has regularly adapted the issue of notices to the actual periods at which vaccination is performed. Occasional notices have been put forth in six other unions. Three unions have announced their arrangements only when a special reason was furnished by an outbreak of smallpox ; and the remaining 11 unions have either issued no notifications at all, or, if there were any, it was long ago, and they are now obsolete. The form of notification was always placard or hand bill. It nowhere occurred to me to see any permanent notice-boards in the public places of the unions, or to find a vaccinating station conspicuously announced as such on its outside. A kind of notification of great value was lately employed in the Wangford Union, consisting of a letter addressed by the clerk to every person who had charge of a child not known to be vaccinated, warning him of the consequences of his neglect. A considerable rise in the vaccinations followed on this letter. A main reason assigned on the part of the guardians for the absence of notifications was the circumstance that the vaccinators habitually made their own arrangements ; while, on the other hand, it had become true, as was stated by the contractors, that people paid no heed to the announcement of the contract arrangements.

Proceedings for the recovery of penalties under the Vaccination Compulsory Acts had been taken in fifteen unions, generally in one or two instances only in each. In twelve of these unions convictions had been obtained, and a penalty had usually been imposed. Often the cases had been stopped by vaccination being performed during an adjournment. In three unions prosecutions had been unsuccessful, either from that provision of the law which, till lately, limited the time for the recovery of penalties, or through the registrar's notice not having been given in due form. Successful prosecutions, pushed to a penalty, have usually been followed by an increase in the local amount of vaccination. No instance has been met with of the second prosecution of the same defaulter, although in several cases children have not been vaccinated after the penalty has been paid. It is the opinion of the clerks of certain magistrates that a second prosecution for neglect of vaccination could not be sustained in the case of one child. The guardians of two or three unions have obtained from the registrars lists of unvaccinated children ; but in the Blything Union only, and there lately, have they given instructions for proceedings to be systematically taken. In the Docking Union, during the epidemic of smallpox in 1860, the guardians resorted to the special compulsory measure of refusing out-door relief to all paupers who had unvaccinated children in their families. This may also be a fitting place to note how the guardians of Norwich, by an arrangement with the contractors, used, before the Act of 1853, openly to bribe parents to have the children vaccinated, and how the vaccinations instantly fell when this plan was abandoned for the provisions of the Compulsory Act. There is still a half belief among the poor of this



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## Individual influence.

city that by being sufficiently obstinate "they shall get their shilling " back again."

I should not conclude this account of the influence of the guardians on the amount of vaccination in their unions, without recording that many of them give great assistance in their private capacity. The chairman of one union has tried to dispel the whims of his parishioners by being himself publicly vaccinated. Other guardians have refused to employ labourers whose families were unprotected from smallpox. On the other hand, as might be expected, some individual guardians were stated to be lukewarm about vaccination, or even adverse to it. Here too should be mentioned the services rendered by other influential persons, in the front rank of whom are the clergy. Several clergymen have been vaccinated themselves, to give confidence in the operation; and have insisted on being registered, to destroy the notion that any one is pauperized thereby. Other clergymen have attended on vaccinating days, and have added the inducements of sweetmeats to their admonitions. Others have even given out in church the arrangements for vaccination.

## Registrars' duties.

B. Influence of the Registrars on the amount of Public Vaccination in the Unions. In 19 of the 27 unions the registrars have given with regularity the notice required (Schedule C.) by the Compulsory Vaccination Act, and have duly kept a minute of the fact of their having delivered it. In 14 of the 27 unions, however, corresponding to 53 vaccination districts, the notice given by certain registrars was not in form according to the contracts; either omitting to announce any arrangements, or announcing merely the house of the contractor, with such days as he himself had appointed. In eight unions there was some other informality on the part of one or more of the registrars. In Yarmouth and Flegg, while notice was always given, one registrar did not keep a minute, except for such cases as were certified to have been successfully vaccinated. In Blofield, Guiltcross, Mutford, and Plomesgate unions there was of each one registrar who had failed in the strict delivery of his notice; and in the Hoxne Union neither of the two registrars had performed any of his functions as regards vaccination for several years. It is very noteworthy that the unions here named stand among the lowest in the recent amount of their public vaccination. And further proof of the importance of the registrar's office in promoting vaccination may be found in the union which stands highest in its recent vaccination. In the Wayland Union it is greatly to the assiduity of the registrars that the public vaccinators owe their ability to vaccinate three quarters of the children before they reach a twelvemonth of age. Here the registrar, besides performing the duties devolved on him by law, has got the children together at stations, and has taken care that none shall stay away without approved cause. One of these registrars had actually succeeded in securing the vaccination of every child born in his sub-district between 1853 and 1859 (deaths and removals excepted), while of the children born between 1859 and the summer of 1861 barely a dozen were not certified to be vaccinated. In three or four other unions, registrars have exerted themselves in a similar manner, but not with such complete success. In 16 of the unions (all rural), registrars have given to the public vaccinators lists of children not certified to have been vaccinated. In six unions this has been done thoroughly, though in one (the Blything Union) only was this action provided for in the arrangements of the guardians.

## Their further action.

## Receipt of certificates by them.

Duplicate certificates of successful vaccination were received with sufficient regularity from the public vaccinators of 15 unions. In six



of these unions the guardians habitually inquired whether the certificate had been delivered before they made payment to the contractors.\* In nine other unions, the duplicate certificates were less regularly received, and were probably sometimes omitted. And in each of the three remaining unions, there was one registrar who has received no certificates and has kept no book.—Of the little private vaccination that is done in rural districts, few certificates have been sent to the registrars; but the more zealous registrars have often taken some pains to get them. In the town districts, where it is of more importance to ascertain the amount of private vaccination, even fewer of these certificates have been sent.

The office of registrar is often held, especially in rural unions, by the relieving officer. I wish to make no imputation on the manner in which others perform their duties, when I observe that registrars who hold this double office usually perform with great assiduity their function as regards vaccination.

C. As for the influence of the contractors themselves on the amount of vaccination in the unions, the law, confining their functions to attendance, operating, registering, and certifying, has entrusted to them very little of such influence. Certainly it was found that a man of regularity, a careful operator, and popular among the poor, had fewer “prejudices” to overcome than his neighbour who had not these qualities. But, in practice, the influence of the contractor has not been confined within such limits. They have almost universally assumed some of the notifying functions of the guardians. They have sent round messengers, printed handbills, engaged the bellman; they have sometimes even, which appears less wise, mixed themselves in compulsory measures. Their contract arrangements proving impracticable, they have made other arrangements, or have taken on themselves to vaccinate from house to house. In fact, in most districts they have done, to the best of their judgment, all that men working singlehanded against many discouragements could do, and far more than the duty imposed on them by law. Considering here only the amount of vaccination, this system of leaving everything to the contractors is not without some *primâ facie* recommendation. In most districts the quantity of the local vaccination is vastly greater on this plan than it would be if the contract arrangements were simply kept to. But in only a very few districts is vaccination pursued on this plan really universal (as universal, for instance, as in the Wayland Union under a station plan). Difficulties too grow upon the man who tries to vaccinate from house to house. Parents forget their own responsibility, and say their children are not vaccinated “because the doctor has not been.” Probably if they refused to let their children be vaccinated just when the contractor happened to call, and afterwards chose to apply at one of the disused contract stations, it would be difficult to charge them with an offence. Then again, the contractor never knows whether he may not be offering vaccination to a patient of some other medical

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Influence of contractors on amount of vaccination.

\* The present system of certifying is considered so irksome by contractors, that if it must be maintained, this check ought to be universally imposed by the guardians. A simpler system is, however, much to be desired; especially it may be suggested that the certificate of successful vaccination (16 & 17 Vict. c. 100. Sched. A.), with its duplicate, should be appended ready for the vaccinator's signature at the bottom of the registrar's notice (Sched. C.) Parents would then be induced to preserve these notices, the operator would be saved trouble, and the registrar would get the duplicate certificate accompanied by the number in his register, instead of having to search through a year of births. Also the registrar's vaccination book would be more valuable, and easy of reference, if it were made in an index or ledger form according to the parishes (or even according to the initial letter of the child's name).

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man. As evasions and refusals multiply, the contractor discovers that he has no one to help him, that the guardians have lost sight of vaccination arrangements altogether. He coaxes, and is not listened to ; he threatens, and is defied. And this goes on until, as has often been stated to me, vaccination becomes the most detestable part of a country practitioner's work. Then the contractor's assiduity almost inevitably flags ; he postpones his vaccination till his leisure times, which are sometimes several years in coming. Then when he does try to vaccinate he finds that the habit of neglect and resistance has grown stronger than he can subdue, and the district may even continue unvaccinated until the next outbreak of smallpox.\*

Age at vacci-  
nation.

\* The age at which children are vaccinated is closely connected with the amount of vaccination. The law requires all children to be vaccinated under three months of age; but in practice (Table A), in the best of unions, the operation is often postponed till after a twelvemonth ; and in many unions vaccinations in infancy have not numbered more than half or two-thirds of the whole number (e.g. Blofield A. 12, Depwade A. 22, Tunstead A. 23, Flegg A. 24), and this, though there has been no particular clearing off of arrears. The largest proportion of infantile vaccination was found in the district best vaccinated in actual numbers ; but it is true of unions, and notably of single districts, that the age at vaccination may be very low in localities very ill vaccinated numerically. The higher ages were especially seen in districts where long intervals elapsed between batches of vaccination ; higher still where a new contractor undertook to make up the arrears of his predecessor ; and highest of all when smallpox is dreaded, and parents run in alarm with their whole families to receive the protection they have before despised.

The lowest ages met with have been in those districts where the vaccinator has tried to prevent the accumulation of arrears, and this has always gone along with a plan of periodic vaccination. Thus, in a district of the Aylsham Union, of 100 children there were vaccinated—

Under 3 months old	-	-	-	-	12
3 to 12 months	-	-	-	-	72
1 to 2 years	-	-	-	-	10
2 to 5 years	-	-	-	-	2
5 years and upwards	-	-	-	-	4

These figures correspond very closely with those that might be calculated from the datum that the contractor vaccinated *once a year all the children* in his district. The following is from the actual practice of the Wayland Union, where scarcely a child escaped vaccination, and the contractor worked through several of the summer months. Of 100 children there were vaccinated—

Under 3 months old	-	-	-	-	20
3 to 12 months	-	-	-	-	70
1 to 2 years	-	-	-	-	2
2 to 5 years	-	-	-	-	0
5 years and upwards	-	-	-	-	8

These were the lowest ages anywhere observed in a thoroughly vaccinated district. The average age here (excluding the eight stragglers) was only seven months.

With these figures may be contrasted the following from a district of the Tunstead union where vaccination was also done through some months of the summer, *but no effort was made to clear off arrears*. A hundred children, taken at random from the register, were vaccinated (in a season free from smallpox) at the average age of two and half years, thus :—

Under 3 months	-	-	-	-	6
3 to 12 months	-	-	-	-	36
1 to 2 years	-	-	-	-	11
2 to 5 years	-	-	-	-	33
5 to 12 years	-	-	-	-	13
12 years and upwards	-	-	-	-	1

A sample of vaccination ages in the practice of a new contractor may be got from another district of this union. The average age of 100 children was a little over four years thus :—

Under 3 months	-	-	-	-	5
3 to 12 months	-	-	-	-	12
1 to 2 years	-	-	-	-	15
2 to 5 years	-	-	-	-	36
5 to 12 years	-	-	-	-	28
12 years and upwards	-	-	-	-	4



It was at some stage or other of this sequence that a majority of the unions visited found themselves. I am convinced that, apart from its ill effects on the quality of vaccination, the performance of the operation universally at the homes of the children has had an injurious effect upon the quantity of vaccination performed.

The causes of insufficient public vaccination dependent upon defective legislation have been to a great extent removed by the Act of 1861, and to this I have always drawn the attention of the local authorities in the unions visited. In commenting on this Act, the suggestion has been made to me from many excellent sources, that the expenses of proceedings under the vaccination laws, and indeed of vaccination generally, would with great advantage be thrown on the common fund of the union, instead of on the poor-rates of the several parishes. It appears an important defect in this Act that no proceedings are contemplated, except for the recovery of penalties. There are other measures, especially the service of a warning on all defaulting parents, which are often more important to the vaccination of a district than the mere fact of a prosecution.

I may be allowed to indicate some further improvements that appear desirable in the vaccination laws. In scattered rural districts it is not so necessary (page 15), and it is not so practicable, to insist upon the vaccination of children strictly before they are three months old, regard being had to the advantages of getting children to meet at stations. Hence, in such districts, arrangements might be permitted for vaccination at periods further apart than three months, provided only that at each such period means were taken for clearing off arrears. A power to make regulations with these objects might well be vested in those who have authority over public vaccination.—Secondly, it is not desirable that all compulsory measures of vaccination should be contingent upon the registration of birth, while that registration itself is not compulsory. I have assured myself that, in practice, registration is much more universally effected in some districts than in others of the counties visited. There appears no reason why the non-registration of birth, or the omission of the registrar to give his notice in good form within seven days, should for ever after prohibit all compulsory measures of any kind.—Thirdly, the vaccination book kept by the registrar ought to furnish evidence as to the vaccination of all the children registered in his sub-district. It is prevented from affording such evidence by sect. 4 of the 16 & 17 Vict. c. 100, which directs certificates of successful vaccination to be transmitted to the registrar of the sub-district *where the child is vaccinated*. The practice in all the unions visited was to send the certificate to the registrar of the sub-district *in which the child was born*. This was even done by registrars who sustained a money loss from the custom. With a very little management, this good practice might be extended (even between union and union, and always in the sub-districts of the same union) all over the country, if legislation did not interfere.

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## Legislation, suggested improvements in.

And the ages at vaccination in a badly vaccinated district, in a year when small-pox breaks out, may be illustrated from the experience of North Walsham, in the Erpingham Union. Of all the children vaccinated in a year, there being no revaccination, the following are the ages per cent. (the average age being  $4\frac{3}{4}$  years):—

Under 3 months	-	-	-	-	-	2
3 to 12 months	-	-	-	-	-	16
1 to 2 years	-	-	-	-	-	12
2 to 5 years	-	-	-	-	-	34
5 to 12 years	-	-	-	-	-	24
12 years and upwards	-	-	-	-	-	12

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—Fourthly, the payment of the registrars, and their functions, might advantageously be revised. Very important assistance to vaccination that could be better given by the registrar than any one else, such as the preparation of lists of arrears and the service of warnings, cannot now be paid for. The registrars almost all feel their present duties to be purposeless, irksome, and ill-paid. There can be little doubt that the sum of 8,000*l.* or 9,000*l.* annually appropriated to the mere registration (necessarily under present provisions incomplete) of vaccination in England, might be spent so as to procure a more useful result.

But in the main it must be allowed, and I have urged the fact on the local administrators of these laws, that the Vaccination Acts are now good and operative, provided that the guardians, registrars, and contractors regularly and judiciously fulfil the functions assigned to them.

*Efficiency of Vaccination.*

## Efficiency of vaccination.

## Tests of efficiency.

The protective value of the vaccination of a community may be brought to the test in three ways. 1. By ascertaining the proportion of smallpox occurring among vaccinated as compared with unvaccinated persons. 2. By learning the method of operating pursued and the precautions taken by the district vaccinators, and appeal to experience as to the resulting advantages of each plan. 3d. By an actual examination of cicatrices on the arms of the children of the district. The first of these ways is applicable only to districts where smallpox has existed, and it would require a larger number of children for the investigation than could actually be examined. Moreover, there would be no means of eliminating the error that arises from the varying intensity of epidemic influence.\* The second of these three ways, besides that it presupposes a more exact experience than we have at command, is open to the serious objection, that the intentions of the vaccinators are not coincident with their opportunities or their success. This means of information can therefore only be considered usefully along with the actual results obtained. The third method gives the most important conclusions. Cicatrices can be examined in sufficient numbers, and can be classified with sufficient exactness for reliable results; and while the connexion between each sort of vaccination and its consequent cicatrix is in some respects obscure, a distinct connexion is established between the number and quality of the cicatrices, and the protection conferred by the vaccination against smallpox; so that it may be confidently stated that that vaccination is the most efficient from which the most and best cicatrices result.

Accepting, therefore, as the test of efficient vaccination in each union the cicatrices seen on the children in its elementary schools, and comparing with the result of this examination the statements made by public vaccinators as to their methods of operating, the enquiry as to efficiency next divides itself into the number and the quality of the vaccine scars.

## Number of insertions of lymph, and of cicatrices found.

1. As to the number of cicatrices on each child, it was stated by 37 out of the 146 vaccinators with whom I conferred that they made two insertions of lymph, by 68 vaccinators that they made three insertions, and by 38 vaccinators that they made four insertions,

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\* Thus it will be shown that the proportion of scarred faces among vaccinated as compared with unvaccinated children was higher at Lynn than at Norwich. But the epidemic influence had evidently been stronger at Lynn. Apart from other considerations, therefore, we could arrive at no conclusion as to the relative protective value of the vaccination in each town.



while 3 only made a larger number than four. None of the vaccinators were in the habit of making a single insertion, though some said that they met with parents who refused to allow of more than one. Many vaccinators, however, regarded the multiplication of vesicles only as a safeguard against failure, and attached value to one successful insertion only. Some few, on obtaining a single vesicle, and not being satisfied with it, were in the habit of vaccinating at the time of inspection another part of the arm from this vesicle, but in each case they failed to produce any further result.

The actual number of the scars seen on the children of the schools was in all cases lower than the number of insertions practised by the public vaccinators. For example, in the Flegg Union there was little vaccination done but by the public vaccinators, and they vaccinated always in four places; but the average number of scars on each child was 2·843 only. Usually, however, the practice of the several contractors as to the number of insertions varied within the same union. An examination of the schools in each union, therefore, gives an average not only of the success of the operators, but also of their varying practice, and sometimes of the practice of their predecessors, or of private practitioners. This must be borne in mind in studying the subjoined Table D.

TABLE D.

NUMBERS OF VACCINE CICATRICES seen on the School Children of 27 Unions.

Union.		Per cent. of <i>Vaccinated</i> Children.				Average Number of Scars on each Vaccinated Child.
		Children with				
		4 Scars.	3 Scars.	2 Scars.	1 Scar.	
1	Flegg, East and West	34·9	28·1	23·4	13·6	2·843
2	Walsingham - -	35·3	26·9	24·2	13·6	2·839
3	Forehoe* - -	30·1	29·1	23·6	17·2	2·721
4	Hoxne - -	16·3	37·3	28·7	17·7	2·522
5	Yarmouth - -	13·6	37·3	30·7	18·4	2·461
6	Mitford and Launditch	12·9	31·5	35·6	20·0	2·373
7	Blything - -	13·6	28·8	35·1	22·5	2·335
8	Henstead* - -	11·5	27·4	44·2	16·9	2·335
9	Depwade - -	13·2	25·1	39·1	22·6	2·288
10	Norwich - -	9·0	29·6	41·4	20·0	2·266
11	Docking - -	13·2	24·2	36·1	26·5	2·241
12	Downham - -	16·4	10·4	47·4	25·8	2·174
13	Aylsham - -	11·7	15·5	49·1	23·7	2·152
14	Tunstead and Happing	6·5	22·0	50·3	21·2	2·138
15	Plomesgate - -	9·0	17·3	46·0	27·7	2·076
16	Wangford - -	11·6	9·4	52·6	26·4	2·062
17	Wayland - -	2·0	26·4	46·9	24·7	2·057
18	Blofield - -	3·3	26·8	41·8	28·1	2·053
19	St. Faith's - -	5·1	12·0	65·8	17·1	2·051
20	Erpingham - -	9·0	13·7	40·9	36·4	1·953
21	King's Lynn - -	6·9	21·5	31·1	40·5	1·948
22	Freebridge Lynn - -	1·3	18·1	48·9	31·7	1·890
23	Swaffham* - -	4·1	12·1	48·0	35·8	1·845
24	Loddon and Clavering	2·8	12·5	50·8	33·9	1·842
25	Thetford - -	4·9	8·8	51·6	34·7	1·839
26	Mutford & Lothingland	3·4	11·9	49·1	35·6	1·831
27	Guiltecross - -	2·1	9·8	55·3	32·8	1·812

One very large scar here counted as two.

\*In these unions, too few children examined for deductions to be very absolutely drawn.

APPENDIX.

II. Local inquiries as to Vaccination.

4. Norfolk and part of Suffolk

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Insertion-success.

Quality of cicatrices.

Single vaccination districts afforded more striking differences and contrasts than the unions. Some contractors were found to fail much oftener than others in producing a vesicle from each insertion of lymph. The rate of their success may often be measured with much nicety in the schools of those districts where there are no other vaccinators. Taking unity as the complete success of insertions made, the rate of insertion-success has been observed to vary from 0·40 to 0·72 and 0·84.

2. The quality of vaccine cicatrices is of course less strictly determinable than their number. Especially it is to be noticed that from the standard being comparative rather than absolute, a scar that is registered as good among indifferent scars may be regarded only as passable when it occurs in contrast with other cicatrices of great excellence. Hence, there results a tendency to the destruction of differences in quality, and not to the exaggeration of them, in the observer's estimate. For the 27 unions the quality of the cicatrices, apart from their number, has been examined in the following Table E.

TABLE E.

QUALITY of VACCINE CICATRICES on the School Children of 27 Unions.

Union.					Per cent. of <i>Vaccinated</i> Children.		
					Typical.	Passable.	Bad.
1	Norwich	-	-	-	73·1	13·7	13·2
2	Henstead *	-	-	-	72·7	13·0	14·3
3	Guiltecross	-	-	-	72·0	13·3	14·7
4	Blofield	-	-	-	71·4	14·5	14·1
5	Walsingham	-	-	-	70·2	14·9	15·0
6	St. Faith's	-	-	-	69·2	12·8	18·0
7	Freebridge Lynn	-	-	-	69·1	15·4	15·5
8	Yarmouth	-	-	-	68·8	17·4	15·0
9	King's Lynn	-	-	-	68·4	16·0	15·6
10	Docking	-	-	-	68·3	16·4	15·3
11	Mitford and Launditch	-	-	-	66·9	17·0	16·1
12	Aylsham	-	-	-	66·3	13·8	19·9
13	Tunstead and Happing	-	-	-	66·0	17·4	16·6
LINE OF AVERAGE QUALITY							
14	Hoxne	-	-	-	64·9	18·5	16·6
15	Swaffham*	-	-	-	64·9	15·0	20·1
16	Wangford	-	-	-	64·5	16·8	18·7
17	Wayland	-	-	-	62·3	16·2	21·5
18	Plomesgate	-	-	-	62·3	13·2	24·5
19	Downham	-	-	-	62·0	17·9	20·1
20	Depwade	-	-	-	61·6	15·2	23·2
21	Mutford and Lothingland	-	-	-	60·0	16·4	23·6
22	Forehoe *	-	-	-	59·1	18·2	22·7
23	Erpingham	-	-	-	58·8	19·2	22·0
24	Loddon and Clavering	-	-	-	58·8	18·7	22·5
25	Flegg, East and West	-	-	-	57·4	17·8	24·8
26	Blything	-	-	-	55·2	20·7	24·1
27	Thetford	-	-	-	52·7	19·8	27·5

\* In these unions, too few children examined for deductions to be very absolutely drawn.



In this table again it is to be observed that each union is an average of several districts, which often differ very strikingly among themselves in the quality of their vaccination. But taking the unions each as a whole, the efficiency of vaccination within it may be very fairly deduced from the two foregoing tables. I have desired to find some means of putting together the two co-efficients of quantity and quality of cicatrix so as to get an index to the efficiency in both respects of vaccination in each union ; but, without introducing hypothetical data, I have found difficulties in doing this with numerical exactness. Approximately, however, the unions stand as follows in the order of the excellence of their vaccination, grouped into three classes :—

Class I.—1, Walsingham ; 2, 3, Henstead\*, Yarmouth ; 4, Norwich ; 5, 6, Hoxne, Flegg ; 7, Forehoe\* ; 8, Mitford and Launditch ; 9, Docking.

Class II.—10, Blofield ; 11, Aylsham ; 12, 13, 14, St. Faith's, Tunstead and Happing, Depwade ; 15, Downham ; 16, 17, King's Lynn, Wangford ; 18, 19, 20, Plomesgate, Freebridge Lynn, Guiltcross ; 21, 22, 23, Blything, Wayland, Swaffham.\*

Class III.—24, Erpingham ; 25, 26, Mutford and Lothingland, Loddon and Claverling ; 27, Thetford.

The *causes* influencing the efficiency of vaccination may be grouped into those connected with local arrangements and those dependent more exclusively on the operator. The local arrangements (A.) promote efficiency in proportion as they provide opportunities for vaccination from arm to arm, and as they permit of children assembling together in such numbers that due selection may be made from amongst those who furnish lymph. In these ways it may confidently be said that the guardians are entrusted with considerable influence over the quality of vaccination. In practice, however, this influence has hardly been exerted, as their arrangements have seldom been actually operative, and as the real working arrangements have been almost universally made by the contractors. In this connexion it need only be said that there is no relation between the amount of vaccination done in a district and the efficiency of that vaccination.

The local arrangements in actual force offer varying facilities for the performance of arm-to-arm vaccination. In the 27 unions, considered as a whole, vaccination is done in this way as follows :—Nine vaccinators operate, either exclusively, or nearly so, from arm to arm. Thirty-one do a majority of their vaccinations in this way. Sixty others operate usually with dry lymph ; still doing some proportion of their vaccinations from arm to arm. Forty-four contractors, lastly, do all their vaccination with preserved lymph, or rarely in any other way. On an examination of the cicatrices produced by vaccinators in these four groups, it may be broadly affirmed that the average of insertion-success and the average of quality are both notably higher among the arm-to-arm vaccinators than among those who use preserved lymph, and that it is therefore highly probable that vaccination from arm to arm conduces to good and efficient results, while vaccination with preserved lymph gives fewer scars ; and of a less protective kind. It is to be acknowledged, however, that among these averages are very great diversities, and that some wet-lymph vaccinators get very inferior results to those produced by other operators who exclusively employ dry lymph.†

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Efficiency (i. e. number and quality together) on test of cicatrices.

Causes influencing efficiency of vaccination.

Local arrangements.

Arm-to-arm operation.

\* Too few schools examined for deductions to have much value.

† The age at which children are vaccinated appears, *cæteris paribus*, to affect the

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Efficiency as dependent on the operator.

Quality-success proportionate to insertion-success.

Ill health in children vaccinated.

Want of due selection of lymph.

It is, perhaps, partly in consequence of more vaccination being done from arm to arm that the quality of the scars was best of all at Norwich. At Lynn and Yarmouth their quality was fairly good. In the smaller towns the scars were usually bad, below the average of the rural districts; and in the country districts there was every kind of variety, the extremes of good and bad quality being seen even in two districts of the same union (e.g., Hoxne, Erpingham).

The influence of the operator himself (B.) upon the efficiency of vaccination is measured in the main by the number and the quality of the cicatrices he produces. It would appear that there is a very near connexion between the insertion-success of an operator (that is, the success with which he gets a vesicle from each insertion), and the quality of the cicatrices produced by him. For a broad instance, a vaccinator who produces an average of three vesicles when he intends to produce four, will more frequently leave typical cicatrices than another who, attempting to produce four vesicles, succeeds in producing an average of only two; and the number of children with typical scars will for the one operator be not very far off 75 per cent., and for the other 50 per cent., of the children vaccinated by him. This rule has been deduced from a scrutiny of the returns from a good many schools; and though it cannot under all circumstances be accurately affirmed, it is well worth the consideration of operators.\*

More particular causes of inefficiency in vaccination are—

1st. Vaccination of children out of health. This error does not seem to be often committed. In one or two neighbourhoods, however, measles has attacked children under vaccination, and severe inflammation and ulceration of the arms has resulted.†

2d. Want of care in the selection of children furnishing lymph. This has been considered generally as resulting from defects in working arrangements. Here it may be added that a very few contractors, convinced that no disease, except vaccinia, can be propagated by the operation, have not hesitated to vaccinate from unhealthy children, and from those who had skin diseases. There was no evidence of harm done, except that the cicatrices in the schools of such vaccinators were of indifferent quality. A far more extended error is the taking of lymph from accelerated or retarded vesicles. It was a very common remark that vesicles frequently did not come to their full growth until the ninth or tenth days, and such vesicles were allowed to furnish lymph. Vaccinators with whom these irregular vesicles were habitual exhibited inferior results in their schools. It often happens that the mother has forced on the contractor lymph of her own selection, and will not let him use any other. I have seen this attempted with the lymph of a revaccination, where the person revaccinated was a popular schoolmistress.—All else being well, I have seen reason to suspect that bad cicatrices may result through the very anxiety of an

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excellence of the cicatrices, the largest being in persons vaccinated during infancy. On this point, however, which has a certain physiological probability, more exact researches are required. There appears no evidence that scars become less distinct with advancing life. In one school the master, vaccinated in 1808, showed me better cicatrices than any child in his school.

\* There appears an exception to this rule when vaccination is practiced by deep punctures. This method seems to have many failures, but to yield good cicatrices when it succeeds. Again, from what has been said, a careful vaccinator making up arrears might get a higher insertion success than success in quality; and many other combinations may be conceived in violation of this rule; but in practice it is still found that failure in insertion and bad quality go together.

† See note, p. 128.



operator to get arm-vaccination. Vesicles must needs be unduly drained when it is the practice (not very uncommon) with the contractor to drive a child on the eighth day of its vaccination, with its mother in his gig, and to vaccinate from house to house through a round of some miles.

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3d. The number of insertions made by the contractors has been stated. The manner of insertion was inquired in 121 cases, and was as follows:—Eighty-eight contractors operated by puncture, drawing only a little blood. Four appeared (by the evidence of scars of cuts in the schools) to vaccinate by a deeper puncture into the true skin. Five others made a compound puncture for each vesicle; i. e. several little pricks with the charged lancet. Seventeen operated by superficially abrading the cuticle over some small area. Seven inserted their lymph along a scratch. Of all these methods, that of abrasion certainly gave the largest sized scars, and in the great majority of instances these scars showed the typical alveolæ well marked. Several of the vaccinators, whose results I should point to as models of what vaccine scars should be, operated in this way, and with very great numerical success; especially preserved lymph was found to give in this manner results successful both in their number and in their quality. Among vaccinators who operated by puncture, some had left excellent cicatrices, others extremely bad ones; and it has seemed to me that it is of more consequence to this method of operating, whether the lymph be used fresh or preserved. Of four vaccinators whose punctures were unusually deep (probably using dry and wet lymph about equally), three had left cicatrices excellent in quality; the fourth of an average kind; but they all seemed to have failed comparatively often with their insertions.

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Manner of operating.

4th. A hundred and thirty-six vaccinators were questioned as to the day on which they took lymph from the vesicle. It was taken habitually on the seventh day by three; on the seventh or eighth day by four; on the eighth day (eighth day meaning the day week) by 110; on the eighth or ninth day by 12; on the ninth day by four; on the eighth to the tenth day, or later, by three of the vaccinators. Few operators had an abstract preference for late lymph, except as being larger in quantity; but they found vesicles often retarded, and took lymph from them equally with more regular ones. Comparing the quality of vaccination shown by the school returns, with the practice of those vaccinators who used other than eighth-day lymph, no very constant result could be made out. Very early lymph (in Thetford and elsewhere) appeared to give much worse cicatrices than those of average operators with eighth-day lymph, yet certainly not worse than the worst of eighth-day-lymph scars. Lymph from ninth-day vesicles, so far as its influence could be traced in schools, gave usually faint and poor scars, but still there did appear exceptions to this rule. The scars of those few operators who disregarded even the areola as forbidding them to take lymph, could not be examined in sufficient numbers for a deduction.

Day of lymph.

Retarded lymph.

5th. The manner of storing lymph has probably an effect on the quality of the vesicle and cicatrix which result from its use. Of the contractors questioned, 95 were found to store on points, eleven on glasses, seven on the stopper of a bottle, two on lancets (others also thus for immediate use), and nine in tubes. Few operators kept their points beyond a few weeks, having found that their efficiency was thus diminished. One or two tried to keep the lymph on their points moist as long as possible. Those who used stoppers also preserved their lymph moist for several days or a week. Vaccinators who stored in

Storage of lymph.

APPENDIX.	tubes used Dr. Husband's form, with the exception of one who employed bulbed tubes. Vaccination scars from the operation with points, and from lymph dried in other methods, comprehend the best and the worst. Dried lymph seems capable of producing as good results as from arm to arm, but demands, and does not always receive, incomparably more care, first in its storage and afterwards in its use. The experience I was able to acquire of the plan of storing in tubes was vitiated by disturbing causes, to which may be ascribed the fact that indifferent scars only were produced by most of the vaccinators who employed these instruments. Storage of moist lymph, without complete exclusion of the air, may have had to do with some ulcerated arms observed in one district where this method was practised; but similar ulceration was observed in other districts in the absence of this circumstance.* And it appears that when lymph is stored on a stopper, it has often as good a chance of drying as of decomposing.
II. Local inquiries as to Vaccination.	
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Care of operator.	I am conscious of having here advanced little beyond what is negative, and to have reached the unsatisfactory conclusion that as much importance attaches to the care of the particular operator as to all other circumstances combined. More accurate information may yet be obtained as to the quality of the cicatrices that result from vesicles of given character and development, in given constitutions at given ages; and the diversities of vesicle and cicatrix produced by lymph taken under varying circumstances, and inserted in various ways, offer still many points for enquiry. A public vaccinator in a country district has excellent opportunities for such researches.
Points for further inquiry.	

*Smallpox and its Connection with the Local Vaccination.*

Smallpox.	Information was obtained regarding this disease (as it affected the 27 unions visited) from the Registrar General,† from the public vaccinators and local registrars, and from an examination of the children in the schools. Again taking the schools as the broadest basis of information, it was found that of 15,041 children, 185 bore scars of smallpox. This was only 1·23 per cent., or one scarred child in every 81 examined. Among 12,053 vaccinated children, 12 only were found scarred with smallpox, being one in a thousand, or 0·10 per cent. Among 184 children whose vaccination was doubtful, two were so scarred. Among 2,804 children unvaccinated, were found
Scarred children in schools of the unions.	

Ulcerated arms.	* The causes of these ulcerated arms were not always plain. Evidence of their occurrence was found in almost every school in two or three per cent. of puckered or glazed cicatrices. Such a cicatrix rarely occurred along with a good cicatrix on the same child. Probably they had often followed mechanical injury of the vesicles. But it is a fact which seems rather to point to some error in the quality of the lymph itself, that these glazed scars were more frequent where some of the insertions only have succeeded than where all have succeeded. Hence it is certain too, that these ulcerative scars do not come from inflammation being excessive through the vesicles being too numerous. Besides being found sporadically, these glazed scars, of recent production, were found together in some numbers in districts of the Erpingham, Tunstead, Walsingham, and Mutford Unions, among others. In some of these places the ulceration had been recognised by the vaccinators, but (except in some districts the supervention of measles) no valid explanation of their cause was offered. In the most serious of these instances of recent date, I had the assurance of the operator, that on inspection on the eighth day the vesicles were perfectly normal, with no sign of undue irritation. Much interest attaches to a determination of the causes, mechanical, constitutional, or in the lymph itself, of the ulceration of vesicles.
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† In a list which he was so good as to supply to me from his office.



the remaining 171 scarred with smallpox, being 6·10 per cent. The vaccinated children were therefore 61 times better protected against disfigurement from smallpox than the unvaccinated children.

The 12 children who were scarred with smallpox after vaccination, bore vaccine scars in the following manner:—One had three good cicatrices, and may therefore be considered to have been efficiently vaccinated. Three had each three bad cicatrices (in two of the children being the glazed scars of ulcerated vesicles). One child had two passable cicatrices, and another had two bad ones. Six children had only one cicatrix apiece, and its quality was bad in every case (in three of these children the scar being glazed). Eleven of the 12 children therefore were inefficiently vaccinated.

The children scarred with smallpox after vaccination, were observed in the schools of four unions only; King's Lynn, Freebridge Lynn, Norwich, and Yarmouth, in districts all urban or suburban. Reckoning as before, in King's Lynn and Freebridge Lynn, the smallpox scars on the unvaccinated occurred 27 times (27·0 and 26·2 respectively) as numerous as on the vaccinated children. On these unions the epidemic influence of smallpox had fallen strongly, and in the efficiency of their vaccination they are found only in the second class.\* In Norwich, by the same computation, the vaccinated were found to be protected against disfigurement by smallpox,  $68\frac{1}{2}$  times (68·5) better than the unvaccinated. Here smallpox had been of frequent existence, but not intensely epidemic at one time, and it has been shown that the vaccination was relatively high in efficiency. Lastly, in Yarmouth, the unvaccinated were scarred 88 times (88·1) more than the vaccinated. In this town, rare sporadic cases of smallpox only had been witnessed, and the efficiency of vaccination was also high.

The children who had never been vaccinated, but who bore scars of smallpox, were in actual numbers far more frequent in the urban than in the rural unions. They amounted to 14·2 per cent. of the whole number of unvaccinated in the schools of Norwich, 29·5 per cent. in King's Lynn, and 28·3 per cent. in Yarmouth.

The rural districts contrasted much with the towns. In four whole unions no child vaccinated or unvaccinated was observed to be scarred with smallpox. In fourteen country unions, only 1—5 per cent. of the unvaccinated were so scarred; and of the remaining six such unions, only one had more than 10 per cent. of its unvaccinated children thus disfigured. Furthermore there is other proof that in the smaller towns and in the villages of the counties visited, there has been very little smallpox for some years, and that little has been singularly sporadic in its visitation. The Docking and Erpingham, among the rural unions, have alone had severe outbreaks in the last few years, while milder epidemics have been observed in the Downham, Forehoe, Hoxne, Loddon, Thetford, and Walsingham Unions. Yet most of the other unions have had some sporadic cases. Too often, people sickening of smallpox, or convalescing therefrom, have been removed to a distance without precaution. Fully twenty recent outbreaks have been described to me as referable to such removals, usually from Lynn, Norwich, or Ipswich, or else (in the case of the coast towns) from London or some seaport. In a purely rural union, even where vaccination is in serious arrear, smallpox, thus imported, rarely spreads widely. The public vaccinator confers the protection of his operation speedily and liberally, his diffi-

APPENDIX.

II. Local inquiries as to Vaccination.

4. Norfolk and part of Suffolk.

Smallpox in urban districts.

Smallpox in rural districts.

\* See classification on page 125. See also note on page 122.

## APPENDIX.

II. Local  
inquiries as to  
Vaccination.4. Norfolk and  
part of Suffolk.Recommendations made to  
local authorities.

culties having for the time disappeared ; and very often the disease can thus be limited to a single house.

I have had occasion to address recommendations to the board of guardians in each of the unions visited, suggesting measures, in all but the Wayland Union, for increasing the amount and regularity of public vaccination, and in all the unions aiming at an improvement in the quality of the vaccination. In the main, I have urged the adoption of arrangements less diffuse than those I found existing. I have pointed out that stations at present considered useless, might be successfully employed if the attendances of the contractor at them were at regular intervals, instead of being so continuous as under the present arrangements. In town districts (reducing where necessary the number of stations), I have recommended weekly attendances, in the larger towns throughout the year, in the smaller ones throughout the summer months. In country districts I have, where necessary, advised the assigning of a separate district to each contractor, and the appointment of stations where none were fixed by contract. Attendance at these stations I have recommended to be at two periods of the year only, viz., for three or four consecutive weeks in the spring, and again after harvest.\* Having attempted thus to provide for each district that form of vaccination, which is at once most popular and most efficient, from arm to arm with a proper selection of lymph, I have next urged on the guardians the desirability of making a periodic effort to clear off all arrears of vaccination, by giving a personal warning to all those who neglect ordinary notifications, and if that should fail I have recommended that they should resort systematically to proceedings for the recovery of penalties.

I have further, as instructed, brought under the notice of registrars and public vaccinators, those parts of the law and of the regulations of the Privy Council which any of them appeared to be transgressing, and in one or two instances I have had occasion to direct the attention of the local authorities to the omissions of their officers.

To my other notes I have appended copies of my recommendations for each union.

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\* To give to parents the opportunity of complying literally with the law, and having their children vaccinated under three months, I have usually further recommended that some one place within each district (usually the contractor's surgery), should be named for vaccination between the six-monthly periods. Though necessary in law, this provision is scarcely necessary in practice.

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## III. STATISTICS of the NATIONAL VACCINE ESTABLISHMENT.

## APPENDIX.

III. Statistics  
of the National  
Vaccine Esta-  
blishment.

## 1. Details for the Year 1858.

Members of the National Vaccine Establishment supplying Lymph for the Public Service.	Vaccinating Stations.	Number of Vaccina- tions per- formed at the Sta- tions re- spectively.	Number of Charges of Lymph supplied from the Stations respec- tively.	Remarks.
Vaccinators salaried from the Parliamen- tary Grant.	1. Surrey Chapel -	2,670	45,412	Was discontinued in December. Was discontinued in June.
	2. Battle Bridge -	327	12,002	
	3. Bermondsey -	373	7,412	
	4. Bloomsbury -	355	13,729	
	5. Dean Street, Soho	205	13,609	
	6. Islington (Upper)	90	12,125	
	7. Islington (Lower)	102	7,487	
	8. Kennington -	42	717	
	9. King Street, Port- man Square -	280	10,147	
	10. Paddington -	72	4,036	
	11. Pimlico - -	162	5,668	
	12. Queen's Square, Westminster -	82	7,932	
	13. Russell Place -	832	27,977	
	14. Shoreditch -	153	5,483	
	15. Spital Square -	204	10,928	
	16. Stepney - -	209	41,311	
	17. Wellclose Square	287	8,175	
Total - {	17 Stations, reduced during the year to 15 - - }	6,445	234,150	See following Tables.
Parochial and other Vaccina- tors, not salaried from the Parlia- mentary Grant, but furnishing Lymph at a fixed rate of payment. }	None - -	None -	None -	
General Total {	17 Stations, reduced during the year to 15 - - }	6,445	234,150	

## APPENDIX.

III. Statistics of the National Vaccine Establishment—*continued*.

## III. Statistics of the National Vaccine Establishment.

## 2. Details for the Year 1859.

N.B.—The Stations named in *italics* are Educational Vaccinating-Stations, authorized by the Lords of the Privy Council for the purposes of their Lordships' Order of December 1, 1859.

Members of the National Vaccine Establishment supplying Lymph for the Public Service.	Vaccinating Stations.	Number of Vaccinations performed at the Stations respectively.	Number of Charges of Lymph supplied from the Stations respectively.	Remarks.
Vaccinators salaried from the Parliamentary Grant.	1. <i>Surrey Chapel</i> -	3,389	72,009	
	2. Battle Bridge	353	23,902	
	3. Bermondsey -	490	8,693	
	4. Bloomsbury -	372	17,194	
	5. Dean Street, Soho	262	13,186	
	6. Islington (Upper)	24	2,283	Was discontinued in March.
	7. King Street, Portman Square -	484	10,268	
	8. Paddington -	16	898	Ditto.
	9. Pimlico - -	49	1,684	Ditto.
	10. Queen's Square, Westminster -	25	2,186	Ditto.
	11. Russell Place -	697	12,634	
	12. Shoreditch -	11	453	Ditto.
	13. Spital Square -	246	14,610	
	14. Stepney - -	135	30,060	Was discontinued in December.
	15. <i>Tottenham Court Chapel</i> -	94	2,752	Began in Dec.
	16. <i>Wellclose Square</i>	440	8,277	
Total	15 Stations, reduced during the year to 10 - -	7,087	221,089	
Parochial and other Vaccinators, not salaried from the Parliamentary Grant, but furnishing Lymph at a fixed rate of payment.	1. <i>Manchester</i> -	1,139	10,032	Began in March.
	2. <i>Birmingham</i> -	267	663	Began in October
	3. <i>Bristol</i> - -	62	390	Began in August.
	4. <i>Hull</i> - -	90	1,462	Ditto.
	5. <i>Newcastle-on-Tyne</i> - -	39	430	Began in Nov.
	6. <i>Oxford</i> - -	55	519	Began in July.
	7. <i>Sheffield</i> -	291	3,216	Began in June.
Total	From 0 to 7 Stations	1,943	16,712	
General Total	15 Stations, increased during the year to 17 - -	9,030	237,801	



III. Statistics of the National Vaccine Establishment—*continued.*

APPENDIX.

3. Details for the Year 1860.

III. Statistics of the National Vaccine Establishment.

N.B.—The Stations named in *italics* are Educational Vaccinating-Stations, authorized by the Lords of the Privy Council for the purposes of their Lordships' Order of December 1, 1859.

Members of the National Vaccine Establishment supplying Lymph for the Public Service.	Vaccinating Stations.	Number of Vaccinations performed at the Stations respectively.	Number of Charges of Lymph supplied by the Stations respectively.	Remarks.
Vaccinators salaried from the Parliamentary Grant.	1. <i>Surrey Chapel</i> -	1,630	16,123	Was discontinued in June.
	2. Battle Bridge -	607	12,361	
	3. Bermondsey -	743	9,513	
	4. Bloomsbury -	281	5,294	
	5. Dean Street, Soho	287	5,986	
	6. King Street, Portman Square -	713	15,674	
	7. Russell Place -	567	4,809	
	8. Spital Square -	293	16,146	
	9. <i>Tottenham Court Chapel</i> - -	1,149	37,530	
	10. <i>Wellclose Square</i>	363	13,154	
Total - {	10 Stations, reduced during the year to 9 }	6,633	136,590	
Parochial and other Vaccinators, not salaried from the Parliamentary Grant, but furnishing Lymph at a fixed rate of payment.	1. <i>Manchester</i> -	1,478	9,947	Began in January. Began in January.  Began in February.
	2. <i>Birmingham</i> -	1,441	9,639	
	3. <i>Bristol</i> - -	242	2,410	
	4. <i>Hull</i> - -	229	4,904	
	5. <i>Liverpool</i> - -	943	26,765	
	6. <i>London (West)</i> -	1,090	none	
	7. <i>Newcastle-on-Tyne</i> - -	418	16,916	
	8. <i>Oxford</i> - -	68	540	
	9. <i>Sheffield</i> - -	514	5,971	
	10. <i>Westminster</i> -	793	14,665	
Total - {	7 Stations, increased during the year to 10 - - }	7,216	91,757	
General Total - {	17 Stations, increased during the year to 19 - - }	13,849	228,347	

III. Statistics of the National Vaccine Establishment—*continued*.

## APPENDIX.

## 4. Details for the year 1861.

III. Statistics  
of the National  
Vaccine Estab-  
lishment.

N.B.—The Stations named in *italics* are Educational Vaccinating-Stations authorized by the Lords of the Privy Council, for the purposes of their Lordships' Order of December 1, 1859.

	Members of the National Vaccine Establishment supplying Lymph for the Public Service.	Vaccinating Stations.	Number of Vaccina- tions per- formed at the Sta- tions re- spectively.	Number of Charges of Lymph supplied from the Stations respec- tively.	Remarks.
Vaccinators salaried from the Parliamen- tary Grant.	Mr. John Newton Tomkins.	Russell Place -	517	4,928	
	Mr. James Furness Marson.	<i>Surrey Chapel</i> -	1,192	21,281	
	Mr. George Lewis Cooper.	Battle Bridge -	408	4,917	
	Mr. Henry Sterry.	Bermondsey -	452	8,273	
	Mr. Robert Wade.	Dean Street, Soho	282	4,772	
	Mr. Arthur Bernard Macann.	King Street, Port- man Square.	349	7,213	
	Mr. Wm. Jones Lewis.	Spital Square -	428	7,411	
	Mr. George Simpson.	<i>Tottenham Court Chapel.</i>	1,260	35,687	
	Mr. Wm. Jones Lewis.	<i>Wellclose Square</i>	412	16,890	
		Total -	5,300	123,362	
Parochial and other Vaccina- tors not salaried from the Parlia- mentary Grant, but furnishing Lymph at a fixed rate of payment.	Mr. Evan Thomas.	<i>Manchester</i> -	1,298	14,948	
	Mr. John Garner.	<i>Birmingham</i> -	1,284	11,259	
	Mr. William Yeoman Sheppard.	<i>Bristol</i> -	270	1,920	
	Mr. John Hare Gibson.	<i>Hull</i> -	275	6,631	
	Mr. Arthur Browne Steele.	} <i>Liverpool</i> -	961	18,816	
	Mr. John Henry Wilson.				
	Mr. John Fenton.	} <i>Pimlico</i> -	755	None.	
	Mr. Wm. Prue Jorden.				
	Dr. T. Fothergill McNay.	<i>Newcastle-on-Tyne</i>	411	25,264	
	Mr. Edward Law Hussey.	<i>Oxford</i> -	43	362	
	Mr. Henry Geo. Allanson.	<i>Sheffield</i> -	690	5,664	
	Mr. Wm. E. Grindley Pearse.	<i>Westminster</i> -	812	16,774	
		Total -	6,799	101,638	
		General Total	12,099	225,000	



III. Statistics of the National Vaccine Establishment—*continued*.

APPENDIX.

III. Statistics  
of the National  
Vaccine Estab-  
lishment.

## 5. Summary for successive Years, from 1809 to 1861 inclusive.

Year.	Number of Vaccinating-Stations maintained by Salaries from the Parliamentary Grant.	Number of Vaccinations per- formed at these Stations.	Number of Charges of Lymph supplied to the Board from all Sources for the Public Service.
1809	8	733	2,580
1810	8	1,493	16,749
1811	9	3,108	23,362
1812	9	3,148	23,794
1813	9	4,521	23,219
1814	9	4,274	25,394
1815	10	4,686	32,190
1816	11	6,581	32,821
1817	11	7,771	44,376
1818	11	9,193	50,043
1819	12	6,289	50,116
1820	12	8,957	51,005
1821	12	6,933	48,105
1822	13	8,229	85,110
1823	13	8,230	—
1824	14	—	—
1825	14	11,354	77,800
1826	14	8,528	98,346
1827	15	8,713	108,635
1828	16	10,263	97,454
1829	15	12,079	100,259
1830	14	11,175	90,681
1831	13	11,326	88,477
1832	13	—	—
1833	13	—	—
1834	13	11,571	83,191
1835	12	—	—
1836	11	—	—
1837	12	—	—
1838	12	18,659	203,818
1839	12	13,144	165,395
1840	12	15,588	160,066
1841	12	15,361	152,668
1842	12	11,105	141,839
1843	12	9,797	158,494
1844	12	13,374	175,362
1845	12	10,167	158,531

## APPENDIX.

III. Statistics of the National Vaccine Establishment—*continued*.

III. Statistics  
of the National  
Vaccine Esta-  
blishment.

5. Summary for successive Years, from 1809 to 1861 inclusive—*cont.*

Year.	Number of Vaccinating-Stations maintained by Salaries from the Parliamentary Grant.	Number of Vaccinations per- formed at these Stations.	Number of Charges of Lymph supplied from all Sources for the Public Service.
1846	13	9,774	155,774
1847	12	10,403	168,489
1848	17	11,790	174,991
1849	17	9,089	172,944
1850	17	10,025	179,370
1851	17	11,984	218,632
1852	17	11,219	215,630
1853	17	11,424	319,808
1854	17	9,198	229,532
1855	17	8,657	220,639
1856	17	7,039	210,942
1857	17	6,327	213,207
1858	17, reduced to 15	6,445	234,150
1859	15, reduced to 10	6,978	237,801*
1860	10, reduced to 9	6,633	228,347†
1861	9	5,300	225,000‡

\* Of these 237,801 charges of lymph, 16,712 were contributed by seven parochial and other stations, which, though subsidiary for this purpose to the parent establishment, do not depend for their maintenance on the Parliamentary Grant. The vaccinations performed at these stations during the time of their contributing lymph were 1,943.—*See* Table 2.

† Of these 228,347 charges of lymph, 91,767 were contributed by nine parochial and other stations, which, though subsidiary for this purpose to the parent establishment, do not depend for their maintenance on the Parliamentary Grant. The vaccinations performed at these stations during the time of their contributing lymph were 7,216. The principal of these contributory stations in the year 1860 were the following:—Manchester, whence Mr. Thomas supplied 9,947 charges; Birmingham, whence Mr. Spratly supplied 9,639 charges; Liverpool, whence the Surgeons of the Ladies' Charity supplied 26,765 charges; Sheffield, whence Mr. Atkin supplied 5,971 charges; Westminster, whence Mr. Pearse supplied 14,665 charges; Newcastle-on-Tyne, whence Dr. McNay supplied 16,916 charges.—*See* Table 3.

‡ Of these 225,000 charges of lymph, 101,638 were contributed by twelve parochial and other stations, which, though subsidiary for this purpose to the parent establishment, do not depend for their maintenance on the Parliamentary Grant. The vaccinations performed at these stations during the time of their contributing lymph were 6,799. The principal of these contributory stations in the year 1861 were the following:—Manchester, whence Mr. Thomas supplied 14,948 charges; Birmingham, whence Mr. Spratly and afterwards Mr. Garner supplied 11,259 charges; Hull, whence Mr. Gibson supplied 6,631 charges; Liverpool, whence the Surgeons of the Ladies' Charity supplied 18,816 charges; Newcastle-on-Tyne, whence Dr. McNay supplied 25,264; Sheffield, whence Mr. Atkin and afterwards Mr. Allanson supplied 5,664 charges; Westminster, whence Mr. Pearse supplied 16,774 charges.—*See* Table 4.



III. Statistics of the National Vaccine Establishment—*continued*.

## 6. PRESENT STAFF of the ESTABLISHMENT.

N.B.—The Stations named in *italics* are Educational Vaccinating-Stations, authorized by the Lords of the Privy Council, for the purposes of their Lordships' Order of December 1, 1859.

## APPENDIX.

III. Statistics of the National Vaccine Establishment.

	Members of the National Vaccine Establishment supplying Lymph for the Public Service.	Vaccinating Stations.	Days and Hours of Attendance.
Vaccinators salaried from the Parliamentary Grant.	Mr John Newton Tomkins.	Russell Place.	Mon., Tues., Wed., Thur., Fri., Sat.; 10—11.
	Mr. James Furness Marson.	<i>Surrey Chapel.</i>	Tuesday, Thursday ; 1—2.
	Mr. George Lewis Cooper.	Battle Bridge.	Tuesday, Thursday ; 12—1.
	Mr. Henry Sterry.	Bermondsey.	Tuesday, Friday ; 2—3.
	Mr. Robert Wade.	Dean Street, Soho.	Monday, Wednesday ; 12—1.
	Mr. Arthur Bernard Macann.	King Street, Portman Square.	Monday, Wednesday ; 10—11.
	Mr. Wm. Jones Lewis.	Spital Square.	Monday, Thursday ; 10—11.
	Mr. George Simpson.	<i>Tottenham Court Chapel.</i>	Monday, Wednesday ; 1—2.
	Mr. Wm. Jones Lewis.	<i>Wellclose Square.</i>	Tuesday, Saturday ; 9—11.
	Mr. Evan Thomas.	<i>Manchester.</i>	Monday ; 2—4.
Parochial and other Vaccinators not salaried from the Parliamentary Grant, but furnishing Lymph at a fixed rate of payment.	Mr. John Garner.	<i>Birmingham.</i>	Monday ; 10—12.
	Mr. William Yeoman Sheppard.	<i>Bristol.</i>	Tuesday ; 10—12.
	Mr. John Hare Gibson.	<i>Hull.</i>	Wednesday ; 9—11.
	Mr. Arthur Browne Steele.	<i>Liverpool.</i>	Monday, Friday ; 9—10.
	Mr. John Henry Wilson.		
	Mr. John Fenton.		
	Mr. Wm. Prue Jordan.	<i>Pimlico.</i>	Monday ; 9—12.
	Dr. T. Fothergill McNay.	<i>Newcastle-on-Tyne.</i>	Thursday ; 1—3.
	Mr. Edward Law Hussey.	Oxford.	Wednesday ; 2—3.
	Mr. Henry Geo. Alanson.	<i>Sheffield.</i>	Tuesday ; 3—4.
	Mr. William E. Grindley Pearse.	Westminster.	Monday, Thursday ; 9—11.
	Mr. James George Gerrans.	<i>Marylebone.</i>	Monday, Thursday ; 10—11.

#### IV. Dr. GREENHOW's Second Report on Districts with excessive Mortality from Lung-Diseases.

##### APPENDIX.

##### BIRMINGHAM and ASTON.—*Button and various Metal Manufactures.*

IV. Local inquiries into excessive mortality from lung-diseases.

Birmingham.  
Aston.

Metal work,  
button making.  
&c.

Birmingham is entirely an urban, Aston partly an urban, partly a rural district. The town of Birmingham comprises the registration district of Birmingham, together with the urban portion of Aston. From its containing so large a semi-rural population, and probably also because it contains a smaller proportion of the working classes, and that there exists less poverty among its inhabitants, the public health of Aston, estimated by the rate of mortality, would seem to be much superior to that of Birmingham. The difference of character in these registration districts is well shown by the fact that, while in Birmingham there were 41,853 persons to each square mile, according to the census of 1851, there were only 1,368 in Aston; and while, on an average, 35 in each 1,000 of the inhabitants of Birmingham were recipients of parochial relief, during the six years previous to 1854 only 10 in the 1,000 of those of Aston were so situated. These facts must necessarily be taken into consideration when the public health of these districts is compared one with the other, the mortality being quite certain to be higher in the denser town district, a larger proportion of whose inhabitants are dependent on the poor's rate for the means of subsistence, than in the more thinly peopled district which comprises a considerable proportion of suburban and a smaller portion of pauper population.

The situation of Birmingham is naturally very salubrious, the ground on which the town is built being undulating and favourably placed for both ventilation and drainage. The subsoil is dry, and there being many large courts and open spaces, the surface is, in very few instances, densely covered with buildings. The houses are generally of fair average size, but are frequently erected back to back, and the internal arrangements are often unfavourable to ventilation. The dwellings seldom contain more inmates than the members of a single family, and are therefore rarely overcrowded.

The annexed Table shows the number of deaths in Birmingham and Aston during each of the last ten years, from diseases of the respiratory organs, exclusive of phthisis, in children under five years of age; and, separately for each sex, in persons above fifteen and not exceeding fifty-five years of age from phthisis and other diseases of the respiratory organs. The proportions which these numbers bear to the existing population of the respective ages and sexes cannot be calculated until the results of the last census shall have been published; but the mortality from pulmonary diseases of all kinds, including phthisis, in Birmingham, during the seven years 1848–54, was at the average annual rate of 8·38 per 1,000 males, and of 6·99 per 1,000 females, that of Aston, for the same period, having been 6·33 per 1,000 males, and 5·39 per 1,000 females, without distinction of age.\*

These rates are considerably in excess of the standard rate,—an excess which, in the case of Birmingham, applies both to children† and adults.‡

\* For an account of the rate of mortality from pulmonary diseases in Birmingham and Aston, see "Papers relating to the Sanitary State of the People of England." London, 1858, p. 70.

† Loc. cit. p. 161.

‡ The following account of the "Standard Rate" is quoted from the Third Report



## BIRMINGHAM.

## APPENDIX.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	436	222	180	80	53
1852	364	229	213	78	63
1853	408	261	188	95	70
1854	643	250	187	94	78
1855	473	241	181	104	86
1856	411	198	173	84	60
1857	418	239	199	96	69
1858	516	220	213	92	60
1859	436	253	201	96	75
1860	495	207	208	117	63
Totals -	4,600	2,320	1,943	936	677

IV. Local inquiries into excessive mortality from lung-diseases.

Birmingham.  
Aston.

Metal-work,  
button making,  
&c.

## ASTON.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	126	74	64	13	20
1852	94	66	52	16	20
1853	120	79	76	32	22
1854	218	69	59	24	16
1855	164	78	73	38	29
1856	159	67	73	16	21
1857	182	59	66	31	22
1858	217	75	73	28	23
1859	185	66	72	22	17
1860	211	79	81	21	17
Totals -	1,676	712	689	241	207

of the Medical Officer of the Privy Council, Appendix VI. p. 103. "Three separate groups of healthy registration districts were selected for the purpose of calculating the standard rate of mortality from certain diseases for England. The first, a Northern group, situated in Northumberland and Cumberland, includes the contiguous districts of Glendale, Rothbury, Bellingham, Haltwhistle, Brampton, and Longtown; the area of the whole comprises 1,256 square miles, and in 1851 contained a population of 56,637 persons. The second, a Southern group, situated in Surrey and Sussex, comprises the contiguous registration districts of Godstone, Reigate, Dorking, Hambledon, Petworth, and Midhurst; it extends over 470 square miles, and in 1851 contained a population of 71,330 persons. The third, a South-western group, situated in the North of Devonshire and Cornwall, included the registration districts of Barnstaple, South Molton, Crediton, Okehampton, Torrington, Bideford, Holsworthy, Stratton, Launceston, and Camelford; it includes

## APPENDIX.

## IV. Local inquiries into excessive mortality from lung-diseases.

Birmingham.  
Aston.Metal-work,  
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The industrial occupations of the people of Birmingham and Aston are very varied in character, and several of them are attended by conditions which, the inquiries made last year in other districts, have clearly shown to be capable either of directly exciting irritative disease of the lungs, or as having an excess of mortality from pulmonary diseases very constantly associated with them. When the census of 1851 was taken, 24·4 per cent. of the men, and 7·1 per cent. of the women of Birmingham, above the age of twenty years, were engaged in the principal metal manufactures of the town. The proportions in Aston were smaller, on account of that registration district comprising a considerable semi-rural area, and containing a small proportion of the working classes, there having been only 18·6 per cent. of the men and 4·1 per cent. of the women employed in the staple manufactures of the district. The occupations included in these estimates are brass-founding, iron manufacture, button making, gun and edge tool making, and goldsmith's work. But besides these, a portion of the inhabitants of the town of Birmingham are employed in glass making, and in the manufacture of electro-plated articles ; of jewellery ; of pearl, ivory, paper, and cloth buttons ; of pins, steel pens, and papier maché goods ; of steel toys, japanned goods, lamps, and similar articles. Men and boys only are employed in some of these occupations ; in others, as in screw making, the manufacture of electro-plated, tin-plated, and papier maché goods, of goldsmith's work, and of certain parts of guns, female labour is likewise in request. In others, again, as in the making of steel pens and buttons, in lacquering and japanning, women and girls are

“ an area of 1,449 square miles, and its population in 1851 consisted of 183,154 persons. In order to give a sufficiently wide basis to the calculations, they were made to comprehend the nine years 1847–55, these particular years having been selected, because 1851, the year of the last census, forms the centre of the term. The subjoined Table shows the average annual rate of mortality per 1,000 persons of either sex from phthisis, from diseases of the respiratory organs, and from the two classed together under the name of pulmonary affections. The paper containing all the results of the investigation is printed in the *Journal of the Statistical Society of London* for June 1859, pp. 253–70, under the title ‘On a Standard of Public Health for England.’ ”

AVERAGE ANNUAL NUMBER OF DEATHS FROM PHTHISIS, DISEASES OF THE RESPIRATORY ORGANS AND PULMONARY AFFECTIONS in each Group of Districts, to each 1,000 Persons of either Sex during the nine years 1847–55.

Cause of Death.	Six Northern Standard Districts.		Six Southern Standard Districts.		Ten South-western Standard Districts.	
	Male.	Female.	Male.	Female.	Male.	Female.
Phthisis - -	2·00	2·29	2·12	2·88	1·95	2·14
Diseases of the respiratory organs (a) - -	0·97	0·75	1·99	1·66	2·51	1·81
PULMONARY AFFECTIONS (b) - - -	2·97	3·04	4·11	4·54	4·46	3·95

(a) This head comprises laryngitis, bronchitis, pleurisy, pneumonia, asthma, and “diseases of the lungs.”

(b) This group consists of the several diseases classed together by the Registrar General under the title of “Diseases of the respiratory organs” and phthisis.



almost exclusively employed. Hence, though only 7 per cent. of the women of Birmingham were employed upon its principal metal manufactures in 1851, the actual number of females of all ages employed in the manufacturing operations of the town is really very large. Children are not put to work at quite so early an age in Birmingham as in several other places where domestic manufactures are carried on ; but a few girls of seven and boys of eight years of age were seen at work, and from eight years upwards a great many children of either sex are employed. Some of the manufactures of Birmingham, such as those of steel pens, papier maché, edge tools, lamps, glass, japanned ware, electro-plated goods, metal bedsteads, and screws, are almost exclusively carried on in large factories. Others, such as buttons, guns, pens, steel toys, jewellery, and brass work, whilst they are partly made in factories, are likewise largely made in small workshops, adjoining the houses of the masters. Indeed Birmingham is remarkable for the great number of small establishments, almost of a domestic kind, belonging to manufacturers who have risen from the class of operatives.

It would be impossible to assign to each of these diversified occupations its exact share in producing the high rate of mortality from pulmonary diseases in Birmingham ; but sufficient evidence was obtained, of the injurious influence exercised on the health of the operatives by several of them, to show that the excess of mortality from these diseases must be largely attributed to circumstances connected with the industrial pursuits of the population. Where the occupations are of so varied a character there is, of course, a corresponding diversity of conditions in the mode of work ; hence the manufacturing processes of Birmingham present examples of nearly all the evils which have been found to exist separately in each of the other manufacturing districts, where enquiry relating to the causation of pulmonary diseases has been made. Certain of the Birmingham operatives are liable to inhale an atmosphere loaded with dust or vitiated by the products of combustion and respiration. Others are employed in overcrowded or ill ventilated workshops, are exposed to great vicissitudes of temperature in going to and returning from their overheated work-rooms, or maintain while at work a stooping constrained attitude. Illustrations of these statements are afforded, as regards the inhalation of dust, by the grinders of swords, edge-tools, gun barrels, steel toys, and fire-irons ; by the pearl button makers, the brass founders, the pin pointers, and, though less evidently, by several other classes of operatives. The jewellers and goldsmiths are exposed to the danger of inhaling air vitiated by the products of respiration and combustion. The button and steel pen operatives, and some of the females employed in making watch-guards and similar articles, besides several other classes of operatives in Birmingham, are but too often exposed to work in over-crowded and ill-ventilated shops. Several of the above classes of operatives are subject to great vicissitudes of temperature in passing to and from their work, and are likewise obliged to maintain a stooping posture while at work. With the exception of the button makers, few or none of the adult operatives of Birmingham work more than a reasonable number of hours during the day ; but none of the special manufactures of the place being under Government inspection, young children of both sexes are employed at an earlier age, or for longer hours, than is permissible in factories worked under the restrictions imposed by the Factory Acts. Several of these manufacturing processes require detailed notice, both in reference to the nature of the manufacture and its influence on the health of operatives.

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*Grinders* form a numerous class in Birmingham, and are employed in the grinding of edge-tools, swords, bayonets, matchets (a kind of bill-hook used in the colonies), gun-barrels, and steel toys. The processes are similar to those of the Sheffield grinders, the finer class of articles being first ground upon a grind stone, and afterwards polished upon a wheel coated with emery. Some of the commoner articles, such as matchets, are only polished upon the emery wheel, and not ground upon the stone; whilst, on the other hand, gun-barrels are only ground upon the stone. Nearly all the grinding in Birmingham is of the wet sort, that is, to say, the grindstones are hung in such a manner as to revolve in troughs of water; but, notwithstanding this, a certain amount of gritty and metallic dust is given off with the spray. This fact is made evident by the particles which lodge on the grinder's hat, and upon other flat surfaces near the stone. The grindstones require to be hacked and "razed," as in Sheffield. The former is a daily process, during which the men are exposed to conditions identical with those of hewers of stone. It is done with a short-handled, broad-bladed, adze, in the use of which the grinder is compelled to stoop over the stone, and thus bring his mouth very near to the surface struck by the adze. All new stones required razing. Hence, as they wear out more or less rapidly according to their size, to the hardness or softness of their substance, or to the nature of the articles ground upon them, the process is of very common occurrence in grinding shops, where several men are at work together. Razing consists in bringing the stone, while revolving on its axis, into a perfectly round shape and to a smooth even surface by means of a bar of steel firmly held against it. Clouds of dust are formed during the process, and fill the atmosphere of the workshop. Swords and bayonets are partly ground upon a grooved stone, by means of which the grooved part of the blade is hollowed out. These stones soon lose their shape; and as they must be razed each time the grooves are repaired, which occurs at least daily where work is plentiful, the men are exposed to inhale the copious clouds of dust given off in the process much more frequently than in shops where only plain stones are employed.

Some improvements have been recently introduced into the grinding-shops of Birmingham; among others a patent process for grinding circular saws between two revolving stones, during which dust is not thrown off in sufficient quantities materially to affect the health of the operatives. A man who was engaged in this employment, and had formerly, when a hand-grinder, suffered from pulmonary disease, said that his health was improved since changing his mode of work. Gun barrels are reduced to the proper size and shape by being ground upon a wet stone; but of late, much of the surplus metal, which was formerly ground off, is now removed by the process of turning, thus leaving comparatively little to be done by the grinder. Indeed, one of the principal gun manufacturers said, that in the course of time the grinding of gun-barrels will probably be entirely done away with; the main difficulty in effecting this improvement at present being the unwillingness of the men, who would object to dispense with the grindstone on account of the high wages paid for grinding. Much bodily strength is required for grinding gun-barrels, and the men are generally compelled to lean over their work, thus compressing the chest and impeding respiration. This attitude is said to be indispensable in grinding the finer sort of barrels; but some of the men, in doing the coarser kind, sit by the side of the grindstone, instead of behind it, and apply the barrel to the stone by means of a lever. This mode of labour both enables the man to avoid leaning over his work, and also removes him from the direct line of the revolving stone, in which any gritty or



metallic particles given off during the process must necessarily escape. It was stated by a manufacturer of edge tools, that machines have been invented for grinding smaller articles, which would in a great measure supersede the usual process, but that the Sheffield grinders have hitherto succeeded in preventing their being adopted.

A few women are employed as grinders in Birmingham. They do not use the stone, but grind small articles called steel-toys upon a wheel termed a "lap," composed of a mixture of tin and lead. Some of these articles are ground by the dry, but most of them by the wet process. In the former case, each woman has a sort of linen screen over her work, which prevents the dust from being dispersed through the atmosphere. Certain articles, such as matchets, are ground upon a wheel covered with a mixture of emery and glue. This work is done chiefly by boys employed by the grinders, and much dust is given off during the process, in the form of a continuous stream of sparks. Swords, bayonets, and the bright parts of gun-locks, after being ground upon a grindstone, are polished upon a wheel with emery. Much dust is created during the operation, but the occupation is not so hurtful as grinding, though eventually men exclusively employed in this kind of labour suffer in precisely the same manner as the grinders upon stone, but not until a more advanced age. To the other evils to which the Birmingham grinders are liable must be added those of working in a damp atmosphere, exposed to the spray from the revolving stone, and also often in damp clothes and with wet feet.

There is but one opinion among the masters, superintendents, and grinders with regard to the unwholesome nature of this employment. Few men, it is said, who have worked regularly at it, attain to the age of 40 or 45 years without suffering more or less from dyspnœa; and several well informed persons connected with the trade asserted that grinders, with very few exceptions, suffer habitually from cough and expectoration after continuing at the occupation for any length of time.

Evidence regarding the state of their personal health was collected from 21 grinders in the course of the enquiry. Excepting that no man under 30 years of age was examined, the men were taken indiscriminately, as opportunity offered, and without selection. Fifteen of the number, though still at work, suffered more or less from dyspnœa, cough, and expectoration; some of them so severely as to be almost incapacitated for their labour; and only six declared themselves to be free from all symptoms of pulmonary disease. Of the 21 men 10 were aged between 30 and 40 years, six between 40 and 50, two between 50 and 60, and three were of the respective ages of 61, 65, and 66 years. Of the latter three, one having only worked for 30 years as a grinder could not have commenced the occupation until he was 36 years of age; a second had been scarcely able to work for several years, on account of suffering from grinders asthma; and the third was said to have not worked, by any means, continuously as a grinder. As in Sheffield, the disease from which the grinders suffer in consequence of their occupation is, in the first instance, bronchitis, which sometimes at a later period becomes complicated with partial pneumonia, leading to consolidation and occasionally to ulceration of the diseased portion of lung.

*Button making* is one of the staple manufactures of Birmingham, and affords employment to a large number of persons of both sexes and of all ages from six or seven years upwards. It is almost exclusively the pearl button makers, of whom there are a great number in Birmingham, who suffer from inhaling dust. Bone and vegetable ivory button makers are much less exposed to breathe a dusty atmosphere, and no conclusive evidence of their suffering from irritative disease of the lungs was obtained. Pearl buttons are cut out of shell, and both in the

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process of cutting out the disks, and also in those of forming and polishing the buttons on the lathe, much dust is evolved. The danger to health from inhaling dust was aggravated in several of the button factories, visited during the enquiry, by the over crowded, ill-ventilated state of the workshops. Many females are employed in this manufacture ; and the duration of labour, it is said, does not exceed nine or nine and a half hours daily. Notwithstanding this assertion there appeared from evidence given by persons well acquainted with the trade, to be little doubt that the hours of labour are much prolonged when business is pressing, and that both male and female button-makers are, at such times, kept at work till very late at night. There was much discrepancy in the evidence regarding the influence of the occupation on health, collected in different shops used for the manufacture of pearl buttons. In some instances the operatives declared their occupation to be entirely harmless ; whilst in others abundant evidence was obtained, from both masters and men, that the workpeople employed in this branch of manufacture suffer much from irritation of the lungs in consequence of inhaling air charged with dust. Further enquiry, and especially a careful examination of the processes of manufacture, showed that this contrariety of evidence arose from a corresponding difference in the kind of article manufactured ; much less dust being created in making small buttons, such as are suitable for shirt fronts and similar purposes, than in making those of a larger size.

The injurious influence of the pearl button manufacture on health was further confirmed by evidence afforded by Dr. Russell, physician to the General Hospital, who has devoted much attention to this subject, and by Dr. Johnstone, another of the physicians to the same institution. One manufacturer represented himself as suffering from the ill effects of the occupation, and said that many of his workpeople were affected in a like manner, few escaping the injurious effects of their employment on reaching the middle period of life. The superintendent of another factory reported himself to have long suffered from cough and expectoration produced by inhaling the mother of pearl dust, adding that this result of the occupation is now so well known that many of the Benefit Societies of Birmingham will no longer admit pearl button makers into membership. As might be expected, the disease from which the pearl button makers suffer in consequence of their trade is chronic bronchitis. This disease runs a very slow course, often lasting many years before finally disabling its subject. Hæmoptysis appears to be a not infrequent attendant on the complaint when fully established.

*Brass-founders* constitute a very numerous class of operatives in Birmingham, and, conjointly with grinders and button makers, largely conduce to explain the prevalence of pulmonary diseases among the adult population. The process is carried on in small shops, usually more or less open to the external air, but very various in this respect. Some few shops, in addition to large unglazed windows, have an opening immediately over the casting-place for allowing the fumes given off by the molten metal free escape into the external atmosphere. Others are low, or, having workshops above them, are without sufficient means for allowing the escape of the fumes given out in the process of casting. The atmosphere of brass-founding shops is exposed to contamination from dust proceeding from two different sources ; the one during the process of making moulds ; the other during that of casting. Moulds are formed in a very fine kind of sand, on the surface of which, when impressed with the shape of the article intended to be cast, flour or some similar fine powder is dusted ; the superfluity of this powder is then blown away by bellows ; and, in the next place, finely powdered



charcoal is dusted on to the surface through a muslin bag, which, on being shaken, fills the air around the operative with a dense cloud of black dust. The dust to which brass-founders are exposed during the process of casting consists of the oxyde of zinc. Brass is made in crucibles or pots plunged into a sunken furnace. Copper is first melted in the crucible; and as zinc—the other chief ingredient of brass—deflagrates at the same temperature at which copper melts, the zinc is only added towards the end of the process. When, after the metals have been mixed together, the crucible is lifted out of the furnace, and more particularly while the molten brass is being poured into moulds, the zinc freely deflagrates, and dense white fumes are evolved, which almost instantaneously fill the atmosphere of the casting shop. These fumes are rapidly converted into snow-like flakes or white powder, consisting of the oxyde of zinc, which remains for some time diffused through the air of the casting shop, and in ill-ventilated shops collects upon the rafters and ceiling in so large a quantity as in a short time to form a thick white incrustation. Of course the danger to health resulting from breathing air containing the oxyde of zinc is greater or less in proportion to the greater or lesser size, and the more or less perfect ventilation of the shop. It also varies in different manufactories, there being more zinc used in the manufacture of certain kinds of brass than of others. Less oxyde of zinc is also given off in remelting brass ingots than where the metals are originally mixed. Hence there is less danger to health in shops where these are used than where the brass is mixed as well as cast. In all cases the danger to health is very much diminished by covering the mouth and nostrils with a handkerchief during the process of casting, so as to exclude the fumes and powder.

Brass-casters are almost unanimously said to be short-lived, and very liable to suffer from asthma.\* The accession of this disease is not rapid, but few of the casters past middle life are entirely free from difficulty of breathing, attended by more or less cough and expectoration. Several masters and foremen distinctly affirmed that the casters are very apt to suffer from pulmonary disease, though by one or two this was considered rather as the result of the large quantity of beer they habitually consume than the consequence of their occupation. In several instances masters, who had risen from the casting shop, said they were themselves suffering from chronic dyspnœa, cough, and expectoration, produced by breathing the atmosphere of the shops earlier in life; and one young man, the son of a small manufacturer, asserted that he rarely failed to suffer from soreness of throat, hoarseness, cough, and expectoration, if he remained long in the workshops during the process of casting. It is impossible to estimate the precise share which the dust given off in making moulds and the oxyde of zinc respectively have in producing bronchial irritation in brass-casters. Indeed, the difficulty in obtaining exact evidence on the subject, always considerable among work people, is much enhanced in the case of brass-founders by the circumstance that exposure to the fumes of deflagrating zinc gives rise to a more immediate series of symptoms of a very definite nature, by which the attention of the men is diverted from their remoter consequences. These symptoms, which collectively may be called “brass-founders’ ague,” are tightness and oppression of the chest, accompanied by certain indefinite ‘nervous’ sensations, followed

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\* The terms “asthma” and “asthmatical” are commonly used by various classes of operatives to designate any form of pulmonary disease attended by dyspnœa arising from their occupation. These terms are therefore employed here, and elsewhere throughout this paper, in their popular and not in their strictly pathological sense.



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by shivering, by an indistinct hot stage, and, lastly, by profuse sweating. The preliminary symptoms generally commence in the afternoon of a day spent in casting, and are succeeded by the shivering in the evening or at bed-time. These attacks are not periodical, but occur at uncertain intervals, excepting that men who have been absent from the shops for some days are said to be more liable to them on resuming their employment, and that men who work in ill-ventilated shops, or who mix the metals, suffer more frequently and severely than such as work in better ventilated places, or only recast brass already mixed. The state of the weather also often determines the accession of the attacks, which are of more frequent occurrence in foggy or heavy weather, when the fumes escape more slowly, than in fine clear weather. These attacks do not appear to lead to any graver result than the temporary inconvenience they occasion,\* the caster being sometimes unable to return to his work on the day subsequent to an attack; but they serve, by the very pronounced character of the symptoms to prevent the men from observing the gradual accession of bronchial irritation, until the occurrence of a severe attack, which is then generally ascribed to the influence of cold or exposure.

*Pin-pointers*, the polishers of electro-plated goods, of jewellery, of wooden handles for tools, and persons employed in sawing boxwood and other hard woods, and also some of the operatives engaged in other miscellaneous manufactures of Birmingham, are liable to breathe air containing dust. Pin-pointers by hand labour now form a very small class in Birmingham, their occupation having been superseded by machines which do the work without endangering the health of the operative. When manual labour is employed pins are pointed upon revolving circular files, and then polished upon a sort of metal wheel. Both these are partly covered by a wooden case or hood to prevent the escape of the dust created during the process; but, notwithstanding this, a large quantity becomes diffused through the atmosphere in the vicinity of the pointer, and may be seen to have settled on his dress and the neighbouring flat surfaces. Most of these men are said to suffer from pulmonary disease. This occupation affords a good illustration of the fact that improved processes of manufacture are very often less injurious to the health of the operatives than older manual processes. The "buffers" and polishers of electro-plated goods and of jewellery form a rather numerous class of operatives in Birmingham. The operation is, for the most part, carried on in workshops at the manufactories; but there are likewise some small shops exclusively appropriated to this employment. In some cases the polishers place a screen between their persons and the wheel in order to intercept the dust brought round in the current of air caused by its quick revolution. Operatives of both sexes, but especially women and girls, are employed in this branch of business, and the hours of work do not exceed 9 or 10 per day. Sufficient evidence was adduced to show that many of these operatives suffer from bronchial irritation in consequence of inhaling dust, an evil which is doubtless often augmented by the crowded state of the workshops. A fine dust is diffused through the atmosphere when the wooden handles of edge tools are being polished with sand paper, and also during the sawing of beech and box woods; but the

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\* It was indeed said by one of the medical men that brass-founders are liable to suffer from paralytic affections; and one old man was seen who suffered from paralysis agitans, which he attributed to long continued habitual exposure to the fumes of oxyde of zinc; but the evidence obtained on this subject is too slight to justify the expression of any other than the statement given in the text.



number of persons engaged in these occupations is not large; and in the former, boys are for the most part employed, who discontinue it as they become older. Several men who had worked continuously as sawyers, during several years, were found to be suffering from chronic cough accompanied by expectoration; and a rule maker who employs many hands, said that the older sawyers are very liable to suffer from asthma. A little fine dust is evolved, and in some measure diffused through the atmosphere in several other manufacturing processes, as in "glazing" and polishing steel pens and in filing metals. It was not ascertained that the persons engaged in these branches of manufacture are particularly prone to suffer from bronchial irritation; but in one manufactory of steel pens the anterior edges of the glazing wheels were protected by a kind of shield, which intercepted the dust brought round with each revolution of the wheel, and the hair and dress of brass filers were often observed to be covered with fine particles of brass. Seeing, therefore, that in the one case precautions have been taken to prevent the dust from being mixed with the air breathed by the operatives, and that, in the other, it reaches his person, it may be inferred that the dust created in these operations is not perfectly harmless.

*Jewellers* are exposed to a combination of hurtful influences. They work habitually in shops which are very imperfectly ventilated, and where gas is constantly being consumed in large quantities for the use of the blow pipe. Many of them lead a very sedentary life, and maintain a stooping constrained posture while at work. There is much difference in the character of different workshops; one or two of the jeweller's factories visited being among the best arranged in Birmingham, others among the very worst. Thus in one large jeweller's manufactory of the former kind, affording employment to a great many persons, chiefly women and girls, the most crowded shop, containing from 150 to 170 persons, gave on the average upwards of 300 cubical feet of space per head. There were means of ventilation by grates above the windows, and by shafts through the ceiling. Nearly all the operatives were burning gas for the blow pipe at the time of visit. The remaining shops in the same factory were much less crowded, and the average amount of breathing space varied from 500 to 650 cubical feet per head. Many girls were employed in the establishment, but the youngest met with was 11 years of age. This was said to be an exceptional case, the manufacturer declining to receive any below the age of 12 years. Notwithstanding the fair amount of breathing space in these shops, several of them were close and very hot when visited early in the forenoon; and though plentiful means of ventilation were provided, these were in several instances rendered practically useless, every aperture for the admission or exit of air being carefully closed. The females employed in this establishment use the blow-pipe very constantly during a large portion of the day, and a few of them consider its use injurious to health, though no sufficient evidence in support of the assertion was adduced. The surgeon who attends the female operatives in this factory reported that phthisis is the most prevalent ailment, though he was not prepared to say that it is commoner among them than among the population in general. One of the partners in another factory of a similar kind said, that many of the operatives who work habitually with the blow-pipe become hoarse, and suffer from some affection of the throat in consequence of their occupation. In a third workshop it was stated by some of the operatives that the use of the blow-pipe, when continued for several hours daily, is injurious, especially when the articles on which it is used are of a heavy kind. In another instance a small manufacturer, who had himself been an operative, confirmed

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this statement, and said he had suffered from pulmonary disease for 10 years, which was induced, as he believed, by the use of the blow pipe.

In another jeweller's factory the largest workshop afforded 300, the smallest 260, cubical feet of breathing space, for each inmate at the time of visit. Ample means of ventilation by casements and shafts through the roof were provided, but they were practically useless, being all closed. Gas was being largely burned for the blow-pipe, and the atmosphere was oppressive and stifling. The operatives here had a pallid unhealthy aspect. The worst workshop of this kind visited was that of a silver watch-guard maker; here the best shop had only 244 cubical feet of breathing space per head, while another, in which 32 females, chiefly young girls, were at work, several of them with the blow-pipe, afforded only an average breathing space of 96 cubical feet for each person. Six entire windows had been removed from their frames for the admission of air at the time of visit, a hot afternoon in September; but it was said that the women will not allow the windows to be opened in winter, when also two stoves are in use to warm the shop. Distinct evidence was given that several young girls who had worked in this shop had been injured in health by its close atmosphere, but the precise nature of their ailment was not ascertained. Of two sisters who worked there one discontinued her attendance as soon as her health began to fail, and has since that time enjoyed perfect health during five years employment in a warehouse. The other having continued to work in this place has broken down in health, and was said to be hopelessly phthisical. Happily this is an extreme case, no other similarly overcrowded workshop having been met with in Birmingham. The workshops in other jeweller's factories afforded various proportions of space per head, from 192 up to 350 cubical feet. Of 13 different shops of this kind, the cubical size of which was estimated, three had less than 220 cubical feet, five had from 220 to 250 cubical feet, two from 250 to 300, and three more than 300 cubical feet of space per head. Collectively, 233 operatives were employed in these shops at the time of visit, but their distribution was extremely various, two shops having not more than five persons at work in them, while others contained 36, 20, and several from 12 to 15 operatives. As a general rule these shops were all insufficiently ventilated, an evil greatly aggravated by the constant consumption of gas; and, as in those previously described, the means of ventilation that existed were, for the most part, closed up to prevent draughts. The duration of labour in the jeweller's shops rarely exceeds  $9\frac{1}{2}$  or 10 hours per day; but the occupation is of a sedentary nature, and many of the men, especially, were observed to be round-shouldered, and to have a sallow unhealthy appearance.

Notwithstanding the very evident evils to which they are exposed, there does not prevail any general impression among the jewellers that their occupation is an unhealthy one. One manufacturer, whose workshops were by no means among the worst ventilated, reported that there had been much illness among his people, the precise nature of which he was unable to state, excepting that colds were prevalent. He attributed this to the very close and almost unbearable state of the workshops in the after part of the day, when the gas is lit, and every aperture for the admission of fresh air carefully closed, and also to the exposure consequent upon passing from these over-heated workplaces into the cold or damp external atmosphere at the close of the day's labour. No distinct evidence of their especial liability to pulmonary disease was obtained from the working jewellers, though here and there one was met with



who suffered from some form of chronic disease of the organs of respiration ; but many of them mentioned their great liability to dyspeptic affections. The greater part of the men employed in this manufacture are comparatively young, few having been noticed who had passed the middle term of life. In all probability such as break down in health cease to work, and so fall out of sight. It is not unimportant to notice, in connexion with this subject, that the jewellers in general earn good wages, and are well housed.

Many of the operatives of Birmingham are accustomed to work in ill-ventilated and over-crowded workrooms. Evidence bearing on this point has already been given relative to jewellers, and it has also been incidentally mentioned that button makers often work in close, over-crowded, and ill-ventilated places. This evil is by no means restricted to these classes, neither is it exclusively met with in factories of an inferior kind, nor in the domestic workshops which adjoin the dwellings of the smaller manufacturers. There are, indeed, some factories in Birmingham, which may be regarded as models of their kind ; but several, in other respects first-class manufactories, were found to be deficient as regards the size and ventilation of some of their workshops. In many instances a small establishment having been developed into a large factory, the older portion has become inadequate to meet the increased requirements of business ; and, although additional rooms may have been erected, the original workshops are overcrowded. In other cases, houses originally designed for private dwellings have been converted into factories, for which they are very ill adapted. Sometimes even newly erected factories were found to be deficient in suitable means of ventilation, or in the amount of cubical space necessary for the number of persons employed in them. Of 35 workshops, of various sorts, but chiefly belonging to the button, electro-plating, japanning, gun-lock, and steel-pen trades, 16 had less than an average of 200 cubical feet of space per head, 10 had from 200 to 250 cubical feet, two from 250 to 300, and seven more than 300 cubical feet of breathing space per head of the operatives who were found at work in them. Of those having less than 200 cubical feet, one with 28 persons, 27 of whom were young girls, had only an average of 128 cubical feet of breathing space for each individual ; a second with 23 men had only 125 cubical feet ; a third with 75 girls had only 128 cubical feet ; a fourth with 100 operatives, and a fifth with 12, had each only 132 cubical feet ; a sixth with 30, and a seventh with 20 operatives, had each only about 160 ; an eighth with from 70 to 80 operatives had about 180 cubical feet of breathing-space per head, as had likewise two others in which 35 and 18 persons respectively were found at work. Some of these shops were ventilated by means of casements, others by grates in the brickwork, or by shafts in the roof ; but these provisions for ventilation were very frequently closed up to prevent the operatives being inconvenienced by draughts of air, and in several of the more crowded shops the atmosphere was close and stifling, although the ventilation was in full action. Many of the operatives in these ill-ventilated shops are also exposed to some of the other hurtful influences already mentioned, that is to say, to exposure to the cold external air after working in over-heated shops, and to working in a stooping or otherwise constrained posture. The effect of these several conditions on the health may, with much probability, be inferred from what has been learned of their influence in other districts, but was not found to be capable of satisfactory proof in Birmingham, in consequence of the great variety of manufacturing processes carried on in that town.

There are several other manufactures in Birmingham, such as those

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of papier maché, of japanned and tinned goods, of lamps, gas-fittings, percussion-caps, screws, and many other articles. Workshops belonging to each of these and to several special branches of the brass or other metal manufactures, and also rooms in factories appropriated to the processes of japanning and lacquering, were inspected; but, where further inquiry appeared to promise no definite result, it was not persevered in, especially in the case of trades which afford employment to only a small number of hands. This inquiry has, nevertheless, sufficiently demonstrated the existence of several conditions hurtful to health, in connexion with the staple manufactures of the town, and likewise that some of these directly induce irritative disease of the lungs, while others, in all probability, indirectly produce pulmonary disease, or at least favour its development. It is satisfactory also to observe that some, at least, of these evils are remediable. Probably most of them might be in a great measure removed if the attention of skilled persons were directed to contriving improved methods of manufacture with especial reference to the health of the operatives.

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WOLVERHAMPTON.—*Metal Manufactures.—Iron and Coal Mining.*

The annexed Table shows the number of deaths in Wolverhampton, from diseases of the respiratory organs, exclusive of phthisis, in children under five years of age, and from phthisis and diseases of the respiratory organs, separately for each sex, in persons aged between 15 and 55 years, in each of the ten years 1851–60.

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Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	260	76	94	68	37
1852	266	86	95	64	42
1853	351	98	121	61	24
1854	397	104	109	55	27
1855	370	102	121	58	41
1856	403	83	81	49	22
1857	372	115	103	55	32
1858	358	84	105	46	32
1859	409	91	101	43	35
1860	408	84	99	52	42
Totals -	3,594	923	1,029	551	334

Until the detailed results of the late census have been ascertained, it would be impossible to calculate with accuracy the proportion which these numbers bear to the living population of the above respective ages; but the mortality in Wolverhampton during the seven years 1848–54, from pulmonary affections, including phthisis and diseases of the respiratory organs under this term, was at the average annual rate of 7·31 per 1,000 males, and of 6·92 per 1,000 females. Wolverhampton differs in this respect from several other manufacturing and mining



districts, that whereas in Birmingham, Manchester, Macclesfield, Leek, and Leeds, and in the mining districts of Redruth, Alston, and Reeth,\* the rate of mortality from pulmonary diseases is higher in adults of either sex above 20 years of age than in persons of all ages, the rate in Wolverhampton is about 1 in the 1,000 less in adults above the age of 20 years than among persons of all ages taken indiscriminately. This, doubtless, arises partly from the very high rate of mortality among young children, but also in some degree from the industrial employments of the inhabitants of Wolverhampton, taken altogether, being less constantly attended by conditions which induce pulmonary disease than is the case with those of the other places with which it is here compared. The rate of mortality from pulmonary diseases in Wolverhampton, both in adults and in persons of all ages and either sex, is considerably above the standard rate; an excess which, as regards the adult mortality at least, may with perfect truth be largely attributed to circumstances connected with the industrial occupations of the inhabitants.†

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The registration district of Wolverhampton comprises the towns of Wolverhampton, Bilston, and Willenhall; a considerable district, almost exclusively occupied by mines, iron-works, and black waste, and also the Seisdon Union, a large and healthy rural district, containing about one-seventh of the population. The circumstance that the Seisdon Union, where the mortality is comparatively low, is included in the registration district of Wolverhampton, tends, doubtless, to lessen the rate of mortality of the entire district. This was shown in a former report to be the case as regards both the mortality from all causes, and that from diarrhœa;‡ and a similar result would most certainly be obtained if the rate of death from pulmonary diseases were carefully worked out for each of these sub-districts. The situation of Wolverhampton is elevated, cold, and bleak, and the sub-soil consists chiefly of clay. The inhabitants of Wolverhampton are employed in agriculture, in various branches of iron manufacture, in brass-founding, and in mining. About one-tenth of the men above 20 years of age, or 9·4 per cent., were employed in the cultivation of the soil in 1851; 10·8 per cent. were locksmiths; 9·1 per cent. were employed in the iron manufacture; a small number were brass-founders and nailers, making, together with those engaged in several other miscellaneous occupations connected with metals, 5·7 per cent.; and nearly 16 per cent. were miners and quarrymen. Only a small number of the women were returned at the census of 1851 as being employed in manufactures; but the number thus employed is really considerable, especially in the japanning works, in the screw and currycomb shops, in lacquering shops, in tin toy making, and also on the banks near mines and iron-works. With a few exceptions in the town of Wolverhampton, the ground is nowhere densely covered with houses; but the latter are often built back to back, and very imperfectly ventilated, and are, moreover, sometimes over-crowded, and therefore small as regards the average cubical breathing space for each inmate. The back alleys and courts, and likewise the interior of the houses, are often in a very foul state. The drainage scheme under consideration at the time of the former enquiry, in 1859, has not yet been carried into effect.§

\* For an account of the rates of mortality from pulmonary diseases in the above mentioned districts, see "Papers relating to the Sanitary State of the People of England." 1858, pp. 62, 64, 70, 75, 76, 78.

† For the standard rates of mortality from pulmonary disease, see foot note pp. 138-40.

‡ See "Second Report of the Medical Officer to the Privy Council," p. 92.

§ Loc. cit., p. 94.



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*Metal Manufactures.*—The great iron-works of Wolverhampton, where iron is smelted, and cast into “pigs,” or manufactured into plates, rods, bars, and other large articles, require but brief notice. The works are generally surrounded by much dense heavy smoke, which renders the air very impure; and a most unpleasant suffocating exhalation arises from the heaps of incinerating iron ore near the blast furnaces; but, with these exceptions, there is nothing in the mode of manufacture which appears likely to produce pulmonary disease. The work is carried on in sheds freely open to the air, and no fine dust arises during the process; but the operatives, especially the puddlers, are exposed to intense heat. These men are said to be not unhealthy, but to become prematurely worn-out by reason of hard work. Sundays only excepted, the works are in active operation night and day throughout the week, one set of men relieving another at stated hours. No time is allowed for meals, which the men take at the works as opportunity offers. Besides this larger kind of iron manufacture there exist at Wolverhampton several foundries and factories where iron vessels and implements of various kinds are manufactured. The men employed in some of the casting shops are exposed to the danger of inhaling dust arising from the sand and powdered charcoal used in making moulds for casting. On a bright day this dust may be plainly perceived in the atmosphere of the sheds, which, at other times, might be supposed to be free from mechanical impurities. Many boys work in these casting-shops; they commence work as early as from eight to ten years of age, and are employed by the men and not by the manufacturer. Iron casters report that they generally enjoy good health, but that they break down rather early in life. The oldest man found at work as a caster, in one of the largest establishments of this kind in Wolverhampton, was under 50 years of age; and the impression among the casters is that they die early, often between the ages of 50 and 60 years, and not seldom rather suddenly. Notwithstanding the assertion that they are a healthy class of operatives, it was clearly established, in the course of the enquiry, that iron casters are subject to morning cough and expectoration. The shops in which they work are abundantly open to the air, which may, with much probability, be assigned as one reason why they do not suffer more severely from irritative pulmonary disease. This free ventilation must of course tend greatly to prevent the accumulation of dust in the atmosphere of the casting shops; and the habitual exposure of the men to the open air will, as in the case of other open air labourers, render them less liable to catarrhal attacks.

In some of these factories iron hollow-ware articles are turned, so as to render them perfectly smooth and even. Large articles are turned by steam power, and little or no dust is thrown off in such a form as to affect the operatives, though the flame of a candle, placed in such a manner as to cast a light into the interior of the vessel, is surrounded by scintillations produced by the combustion of iron dust. In turning smaller articles, a small quantity of metallic dust is thrown off into the atmosphere around the workmen, but, being of a heavy nature, it soon falls to the ground. Many of the men engaged in this process cover the mouth and nose with a sponge, in order to exclude the dust from the air passages, and state that, unless they protect themselves in this manner, the dust is apt to irritate the nasal passages, and to produce cough, attended by a black expectoration. Two or three men met with in this department were found to be suffering from chronic pulmonary disease, which they attributed to inhaling the dust giving off in turning; and two manufacturers, in different establishments, spoke of this employment as being liable to produce disease of the lungs, unless proper precau-



tions be adopted by the men to avoid all risk of inhaling iron dust. APPENDIX.

Many of these hollow-ware articles, after being turned, are enamelled on the inside to prevent corrosion. This process is attended by conditions not unlike those to which the china scourers in the Pottery Districts are exposed. After being coated on the inside with a certain composition applied in a moist state, and dusted over with finely powdered glass, the vessels are brought to a red heat in an oven; some more of the glass is then dusted over the former coating, and the vessels returned to the oven. This alternate dusting with glass and exposure to a high temperature is continued from time to time until the enamel forms a complete uniform lining closely adherent to the metal. Both in dusting the glass on to the vessels, and also during the process of sifting it, so as to ensure the requisite degree of fineness, the air is more or less impregnated with powdered glass. It may be well to say that the glass used for this purpose is of a particular kind, and that there is more than one process for enamelling the interior of cooking pans and similar articles. Lead enters largely into the composition employed for enamelling in one of the factories visited; and indubitable evidence was obtained that the operatives engaged in the process are liable to suffer from the effects of poisoning by lead. The operatives who work in the enamelling shops asserted that no injury to health arises from their occupation, but some of the other men employed in the works, and in one instance a manufacturer, expressed a different opinion. The men at work in the sifting rooms, however, cover the mouth and nostrils with a handkerchief to exclude the dust. Formerly the powdered glass was sifted in a hand-sieve, but this process is now done by means of a covered machine, which renders it much less likely to prove hurtful to the operatives, though, even in this improved mode of sifting, much dust escapes into the atmosphere of the room.

There are in Wolverhampton several edge-tool factories in which grinders are employed. The aggregate number of grinders in Wolverhampton is not large, but they are exposed to influences similar to those of the wet-grinders of Birmingham and Sheffield. Locks and keys are largely manufactured in the Wolverhampton district, chiefly at Willenhall. Keys and bolts for locks, tips for shoes, cork screws, steel toys, and similar articles, are polished upon wheels coated with emery, such as have already been described in the paper on Birmingham. The operatives employed in this branch of manufacture often suffer from chronic bronchitis, in consequence of inhaling the dust given off during the process. In some of these Wolverhampton factories, however, the danger to health from inhaling dust is greatly lessened by the circumstance that, in most instances, the same operative who begins also finishes the article. Hence it follows, that in such workshops, no one is employed exclusively in the dusty department.

Although less common than in Birmingham, brass-founding is comprised among the manufactures of Wolverhampton. As in the former town, the brass-founders of Wolverhampton suffer both from brass-founders' ague and from bronchitis. Very definite information relative to the prevalence of the latter ailment was obtained from a small but very intelligent manufacturer, who said that several of his casters had become asthmatical since he commenced business, but a few years since. He attributed this fact much more to the dust thrown off in preparing the moulds than to the fumes of oxyde of zinc; an opinion which derives support from the circumstance that brass was not made but only remelted in his shops, during which process oxyde of zinc is

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given off into the atmosphere in much smaller quantity than in those shops where the metals are mixed. Brass-casters suffer much more generally from chronic pulmonary disease than iron-founders. Indeed, the former sometimes improve in health after changing their occupation for that of the latter; a circumstance that might have been expected, seeing that, irrespective of exposure to the fumes of zinc, brass-casters employ finer materials than iron-founders in preparing their moulds. Many of the operatives of Wolverhampton, though fewer in proportion to the whole number than in most manufacturing towns, work in rooms ill ventilated, either from deficiency of cubical space in proportion to the number of inmates, or from the method of ventilation being, as in several places described in last year's Report,\* unsuitable to the requirements or comfort of the workpeople. Thus, in one workshop, containing twenty-four persons, where the atmosphere was very close and oppressive, the only means of ventilation was by casements made to open at a height of  $4\frac{1}{2}$  feet from the floor. None of these casements were open when the shop was visited on a fine afternoon in September, the operatives alleging as a reason for keeping them closed that the draughts of air which they admitted gave them cold. The same description applies to another shop, in which also twenty-four hands were employed. In the former of these shops each inmate had on the average 156, and in the latter 175 cubical feet of breathing space. Other shops afforded an average of 160, 170, 175, 205, 270, and upwards, to 430 and 600 cubical feet of breathing space for each inmate. The factories in which the deficiency of space was most apparent were several of the japanned-ware factories, of which there are 10 or 12 in Wolverhampton and Bilston, a tin-toy manufactory, several small screw factories, and some shops for making gas fittings.

*Ironstone and Coal Mining.*—The mines of the Wolverhampton District are of two sorts, coal and ironstone, which are often found in juxtaposition to each other and belonging to the same owner. Some times the miners work exclusively in one or the other, sometimes alternately in both kinds of mines. Although it would be impossible to ascertain the proportion in which the mining operations of the district contribute to produce the excessive mortality from pulmonary diseases, until the proportion of miners to the entire population at the time of the last census can be determined, it is at least quite certain that they are exceedingly liable to suffer from these diseases. From the circumstance that the miners do not work exclusively in either kind of mine, the whole class may be regarded as exposed to similar conditions, though varying in degree in different mines; some of these, even when of the same description, being less injurious to health than others. Judging, on the one hand, from the prevalence of irritative pulmonary diseases among quarrymen and stonemasons, and, on the other hand, from the singularly low rate of mortality from these diseases in certain of the Durham colliery Districts,† it may perhaps be

\* See the Report on Birmingham, ante, pp. 148 and 149, and also the Reports on Leek, Hinckley, Towcester, Newport Pagnell, and Birkhamstead, in Appendix VI. to the "Third Report of the Medical Officer to the Privy Council."

† Nearly half the adult male population of Easington and Houghton-le-Spring are employed in the coal mines, yet the mortality from pulmonary affections of all kinds, including phthisis, during the septennial period 1848-54, was only at the average annual rate of 2.22 per 1,000 males in Easington, and of 3.64 in Houghton-le-Spring. See "Papers relating to the Sanitary State of the People of England," p. 65. In Durham, where 36 per cent. of the men were coal miners in 1851, the average rate of mortality from the same class of diseases among males during the nine years 1847-55, was 4.23 per 1,000.



assumed that ironstone mining is more prejudicial to health than coal mining. With the exception here stated similar conditions prevail in both the ironstone and coal mines of Wolverhampton; and though generally different in degree, they are identical with the conditions which produce the excessive prevalence of pulmonary diseases among lead, tin, and copper miners.\* These conditions are defective ventilation of the mines, and the diffusion through their atmosphere of impalpable dust, and of the smoke and other products of the combustion of gunpowder used in blasting the mineral.

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The greater part of the mines in the Wolverhampton district are of small extent, employing but few hands, sometimes not more than eight or ten. The mineral of the district is nearly exhausted, the whole country being, so to speak, riddled by mining operations; and the surface of the earth for several square miles presents the appearance of a black waste of shale and refuse, interspersed with tramways, pools of water, and the machinery necessary for working the pits, varied here and there by the blast furnaces and other buildings connected with iron works. The undermined state of the country is shown by the great number of ruined and misshapen houses caused by the shrinking of their foundations. So frequent, indeed, are the disturbances of the surface from this cause, that roadways, canals, gas-pipes, and drains are continually being damaged by the displacement of the surrounding earth consequent upon the sinking down of the roof of wrought-out mines.

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The mines are generally worked under the management of an officer termed a "charter master" or "butty," who very frequently has risen from the condition of a common miner, and is by no means equal, either in education or station, to the "viewer" or mining engineer who superintends the operations and provides for the proper ventilation and safe working of the coal mines in the Northern Coal Field, and in some of the larger and better managed mines of North Staffordshire. In many instances the "butty" contracts with the owner to raise the mineral at a fixed price, and engages men to work the mine, which, of course, he endeavours to do as cheaply as possible, his profit consisting of the difference between the sum he receives and the expense he incurs for working and raising the mineral to the surface. It is evident that of the two evils already referred to as existing in these mines defective ventilation is the greater, seeing that where the ventilation is active the smoke and other products of combustion, and also the dust, will be rapidly carried away; whilst, on the other hand, they will linger in the atmosphere of ill-ventilated mines.

In order to elucidate this subject it will be useful to describe the mode of ventilation employed in the larger sort of mines already referred to.

The coal mines of Northumberland and Durham, and the larger mines of North Staffordshire, are often of great depth and wide extent. One of Lord Granville's mines, near Shelton, visited in 1860 for the purpose of comparing the mode of ventilation with that of lead mines, was 507 yards in depth, and in one direction extended to nearly a mile from the bottom of the shaft. One or two mines are reported to be of the depth of 300 fathoms or 600 yards; and when both the main and lateral roadways are taken into account, their workings must extend to many miles in length. It is obvious that the atmospheric air would very imperfectly penetrate the intricacies of these mines, even though no gases were given off from the strata, unless artificial means of ventilation were provided. On this account the principal coal mines are either provided

\* See "Third Report of the Medical Officer to the Privy Council," Appendix VI., pp. 129-135 and 138-144.



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with two shafts, or with a single shaft divided by a kind of partition called a "brattice." One of these shafts or divisions, called the "down-cast" shaft, is that by which pure air enters the mine, whilst the impure air passes out through the other or "up-cast" shaft. This arrangement generally produces a current of air through the mine from one shaft to the other; but this current would naturally take the shortest course from its entrance to its exit, unless means were employed to ensure its distribution through the more distant roadways and galleries of the mine. Moreover it should be observed that the particular shaft which served for either the down-cast or the up-cast current of air, depending greatly on the temperature and pressure of the external atmosphere, and the direction and force of the wind, would be uncertain, and each shaft would serve alternately for the transmission of either the "down-cast" or the "up-cast" current. In certain states of the weather the atmosphere of the mine would be almost stagnant, or the direction of the currents so uncertain that the pits, to use the expressive language of the South Staffordshire miners, would "fight," during which no one could with safety enter the mine. In order to render one shaft with certainty a "down-cast," and the other an "up-cast shaft," a large furnace is constantly burnt at the foot of that through which the outward current of air is intended to pass. This rarefies the air within the shaft, causing it to ascend rapidly into the external atmosphere, whilst a powerful current of air sets in towards the furnace from the workings, in lieu of which fresh air is drawn into the mine by the "down-cast shaft." This contrivance not only renders the direction of the currents of air constant under all conditions of the external atmosphere, but likewise overcomes the resistance, caused by friction, to the progress of the air in its course through so great a length of underground galleries. Even this means, however, while it ensures the passage of a current of air through the mine, would fail to convey fresh air to its innermost recesses, seeing that the air would still find its way by the most direct route from the point of entrance to that of exit. In order to obviate this, and insure the perfect ventilation of the smaller or remoter workings, a very complicated system of doors, partitions, and other contrivances is employed for guiding the current of air in the required direction, or even splitting it, so that one part of the current may pass up one and another part up a different roadway. The air is often thus conveyed in a very tortuous manner, even sometimes being made to turn upon its course in a backward direction, so that pure air is carried into every part of the mine, and up to the face of the work where the men are hewing, in sufficient quantity not only for respiration, but also to dilute, render harmless, and sweep away in its current the gases disengaged from the strata. It is, doubtless, owing to this admirable system of ventilation, skilfully modified by the "viewers" so as to meet the exigencies of particular mines, that the miners of the Northern Coal Field suffer so little from the diseases engendered by working in an imperfectly ventilated atmosphere. It is the want of this or of some equally effectual mode of ventilation that renders the miners employed in lead, tin, or copper mines so subject to pulmonary diseases and premature death; and it is to the same cause, as will presently appear, that the miners of Staffordshire and Wales die in so much larger a proportion from these diseases than those of Northumberland and Durham.

It is asserted that the mineral of the district being nearly exhausted, this complicated and expensive mode of ventilation, requiring the consumption of much fuel to rarefy the air, and the constant watchful attention of under viewers and other officers, is not applicable to the small



mines of Wolverhampton, by reason of the expense it would necessarily entail. It is at least certain that these mines are by no means perfectly well ventilated. Indeed, it was stated both by Mr. Wynn, Her Majesty's Inspector of Mines for North Staffordshire, and likewise by a Durham viewer who has the superintendence of the mines at Shelton, that neither in North nor in South Staffordshire are the mines so well ventilated as in the Northern Coal Field. This statement, made in 1860, was confirmed by several persons connected with mining operations in Wolverhampton; one of whom, an eminent mining engineer, reported that the ventilation of both the coal and ironstone mines in that neighbourhood is very imperfect. Although these mines are furnished with what are termed "down-cast" and "up-cast" shafts, the latter is rarely provided with a furnace to rarefy the air. Hence the direction of the ventilating current is very uncertain, and depends much on trivial and changeable circumstances. A stagnation of the air, when the pits are said to "fight," is not uncommon, during which time no mining operations can be carried on. In small mines the men cease working at such times; in others, a small iron basket of fire is suspended by a chain from the top of the "up-cast" shaft, thus imitating in a less efficient manner the process employed to rarefy the air in the "up-cast" shaft of better ventilated mines. But though imperfect ventilation is common, the mines of Wolverhampton are not all equally deficient in this respect. In some the up-cast shaft is arched over at the top; and by its side, on the surface of the earth, is a closed furnace dependent on the shaft for its supply of air. This causes a considerable draught of air through the shaft, which passing through the furnace finds its way out by the chimney, and must be replaced in the mine, by the admission of fresh air through the "down-cast" shaft. In other cases, a tube, fitted at the upper end with a moveable funnel-shaped cowl that shifts with the wind, is conveyed from some distance above the surface of the earth to the bottom of the shaft; and, even sometimes into the recesses of the mine, by means of a tube joined at right angles to the descending tube. The best even of these plans is, however, said to be an indifferent substitute for the above described more costly but much more effectual system of ventilation.

The mines both of coal and ironstone in the Wolverhampton district are wrought by means of blasting, which creates much dust, besides powder smoke and other products of combustion, that linger in the atmosphere of ill-ventilated mines, until, in mining phraseology, they "die out." Much "damp" or gas is also disengaged from the strata, especially in the disused parts of mines. One of the seams of coal is very thick, and is worked by what is called the "pillar and stall" system, that is to say, large pillars or blocks of coal are left to support the roof. These interfere with the perfect ventilation of the mine, rendering it more difficult to convey fresh air up to the face of the work; and when, eventually, the mines are worked over a second time for the purpose of getting the coal left at the former working, the men are exposed to breathe an atmosphere much tainted with gasses disengaged from the strata. From this it follows that working in broken mines, in which the residue of a former working is being wrought, is more dangerous to the health of miners than mining in previously unbroken ground.

The ventilation of the mines near Wolverhampton is said to have been much improved through the agency of Her Majesty's Inspectors, especially as regards the more regular and better construction of "air-heads" or ventilating channels. Formerly these necessary works were often omitted by the "butties" for considerable distances, so that the men were virtually working in "fast ends," that is, *culs de sac* having

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no communication with adjoining galleries excepting by their entrance, where the air was very impure from an admixture of dust and of gasses unsuitable for respiration. But even making large allowance for these improvements, the evidence collected from various persons conversant with mining was such as clearly proves the ventilation of many of these mines to be still very imperfect. It was, indeed, stated by several "butties" that the passage of too brisk a current of air through the mine is apt to excite spontaneous combustion in the coal left at the first working; a statement which is, however, rather in favour of adopting, if possible, some mode of working the mineral whereby no remnant would be left, than an argument against the employment of such means of ventilation as would render the atmosphere of the mine healthful to the miners.\*

Before adverting to the diseases caused by working in ill-ventilated coal and ironstone mines, it is perhaps necessary to observe that the miners of Wolverhampton do not form so distinct a class, either as regards appearance or habits, as those of the Northern Coal Field, or of Cornwall. Many men, especially Irishmen, are met with among the miners of South Staffordshire, who have taken up the occupation somewhat late in life, after working for a time at some other kind of labour. Whilst, in other places, miners cottages are generally inhabited by the members of a single family, they are here often overcrowded from the common custom of taking lodgers. The houses are often very meanly furnished, and the men themselves uncleanly in their habits, thus presenting, in both these respects, a striking contrast to the pitmen of the Northern counties, who habitually wash themselves thoroughly on returning from work, and whose houses are, for the most part, well furnished and remarkably clean.

Ample evidence of the injurious influence of their occupation on the health of miners was obtained in the Wolverhampton District. Several of the resident medical practitioners mentioned the great prevalence of chronic bronchial affections and of phthisis among the miners, which they attributed partly to the cold bleak climate of the district, but likewise partly to the miner's employment. Evidence of the prevalence of what they termed asthma among the miners was likewise obtained from several ground bailiffs, managers, butties, and other persons employed about the mines. Out of 25 of these persons who were examined, nearly all of whom belonged to different mines, only four stated the occupation of mining to be a healthy one; and two of these qualified their evidence by adding, that when men work in mines containing much "damp," that is to say, gaseous exhalations from the strata, they are very liable to suffer from dyspnœa, cough, and expectoration. The remaining 21 agreed in the opinion that both coal and ironstone miners are more liable to suffer from asthmatical disease than other people. One of these, who was a kind of overseer, said that six of his men, of ages varying from 28 to 55, either had died or were suffering from miner's asthma. Another of these persons, a ground bailiff, gave similar evidence. He considered the colliers as being naturally a healthy race, but said that a great many of them suffer from asthma; which fact he attributed to their habitually working in air impregnated with carbonic acid gas, and to their constant habit of working in damp clothes. Five or six of his men had been incapacitated from following their calling by asthma induced by the above

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\* Valuable information relative to the mode of working and ventilating the mines of Wolverhampton was courteously afforded during the inquiry by Mr. Baker, Her Majesty's Inspector of Mines for South Staffordshire, and likewise by Mr. Becket, Mining Engineer and Professor of Geology in Queen's College, Birmingham.



causes. He added that it is more hurtful to work in broken mines, for the purpose of getting out the residue left at a former working, than in virgin mines, on account of the greater difficulty experienced in ventilating the former than the latter. A butty or charter master, who, when in full work, employs 120 men, said that both colliers and ironstone miners are very subject to asthma. Much dust and powder-smoke are, he said, diffused through the atmosphere of the mines, and the men suffer in proportion to the amount, which depends upon the efficiency or inefficiency of the ventilation; well ventilated mines being much less injurious to health than such as are ill ventilated. Some miners retain their health till an advanced period of life, but the greater number suffer, more or less, from asthmatical symptoms before attaining the age of 50, and many break down and are disabled at from 40 to 50 years of age. Similar evidence was given by several other persons connected with mines; among others, by a collier who had formerly worked in some Cumberland coal pits. This man said that asthma is more prevalent among the colliers of this district than among those of Cumberland, and ascribed the difference to the less perfect ventilation of these mines. A worn-out collier, 60 years of age, said he had been afflicted with asthma for many years, and that several of his fellow workmen had died of that disease long before attaining his age. At the present time he knew seven or eight miners who were incapacitated for work by asthma, which, he said, had been brought on by working in bad air, that is, air vitiated by "damp" and dust. Had himself worked in both coal and ironstone mines, but considered the latter more injurious to health than the former; adding, that where 6, 10, or 12 men are "holeing" near together in ironstone, much dust is diffused through the air in their neighbourhood. Another and very intelligent miner gave evidence to the same effect, reporting that many of the miners break down towards middle life, but that something depends upon the constitution of the men, and much upon whether or not they habitually work in ill ventilated places, or in mines that give out much "damp." Even the worst pits, however, are not equally dangerous at all times, much depending upon the direction of the wind and the state of the weather. Mines may be perfectly free from "damp" for several months, and then, owing to a change in the state of the external atmosphere, this gas may be disengaged in such large quantities as to render it unsafe for the men to descend into the pit. The manager of some large iron works, who had been intimately connected with miners for nearly half a century, said that, as a class, they suffer much from asthma; that a miner is usually an old man at 50; and that few men, unless they be Irishmen who have turned to mining late in life, are found at work beyond that age. Other evidence to the same effect was obtained; and though some older men were seen who had escaped every symptom of pulmonary disease, the majority of the older miners were found to suffer, at least in some measure, from dyspnœa, attended by more or less of cough and expectoration.

It was found more difficult to meet with broken-down miners, for the purpose of examination, in the Wolverhampton district, than in the mining districts visited and reported on last year; but such as were examined were found to be suffering from the same class of ailments as the Cornish and lead miners. Chronic bronchitis and its results are the complaints to which the Wolverhampton miners are subject, but the disease appears to be slower in its progress than is the case among tin, copper, and lead miners. A greater proportion of the Wolverhampton miners likewise escape the disease, or suffer from it in a mitigated form, and there is a greater tendency to recovery after ceasing to work in the mines. Several old miners were seen, who, having ceased to work

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under ground in consequence of miner's asthma, had, in a great measure, recovered their health, and were able to follow some light occupation on the surface of the earth.

MERTHYR TYDFIL AND ABERGAVENNY.—*Coal and Ironstone Mining.*

Merthyr Tydfil and Abergavenny are districts of coal and ironstone mining. The latter is smelted in the vicinity of the mines, and the iron manufactured into large articles, such as rails, plates, bars, rods, and the like. These districts resemble Wolverhampton in the fact of combining iron and coal mining with iron manufacture, but they are entirely without the smaller and more varied manufactures which there form so important a source of employment. More than half the men above the age of 20 years of each district, or 53 per cent. in Merthyr Tydfil, and 64 per cent. in Abergavenny, were engaged in the three occupations conjointly of iron manufacture, coal and ironstone mining, in 1851, when the last census was taken. An uncertain proportion of the women, especially the unmarried women, are also employed at the mines, but above ground. The annexed Table shows the number of

MERTHYR TYDFIL.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	91	137	114	24	10
1852	107	122	113	22	11
1853	103	117	134	26	13
1854	128	85	99	33	12
1855	154	111	128	48	23
1856	133	108	131	42	16
1857	212	123	122	42	18
1858	258	153	167	52	23
1859	221	154	133	42	33
1860	234	156	142	34	37
Totals -	1,641	1,266	1,283	365	196

ABERGAVENNY.

1851	53	55	48	22	17
1852	102	47	65	29	12
1853	162	51	78	35	17
1854	147	63	49	21	13
1855	121	66	68	36	21
1856	134	49	61	26	16
1857	147	79	71	29	16
1858	152	65	70	27	14
1859	167	73	101	20	18
1860	128	57	96	33	12
Totals -	1,313	605	707	278	156

deaths in each district from diseases of the respiratory organs, exclusive of phthisis, in children under the age of 5 years; and from phthisis and



other diseases of the respiratory organs, in males and females respectively, between the ages of 15 and 55 years, in each of the ten years, 1851-60. The proportion which the mortality bears to the population at these ages cannot be determined with accuracy until the publication in detail of the results of the late census; but 6·61 per 1,000 of the male inhabitants of Merthyr Tydfil, and 6·54 per 1,000 of the female, on the average, died from pulmonary affections in each of the seven years 1848-54. The rates of mortality from the same diseases in Abergavenny, during the same period, were not very different, having been 6·62 per 1,000 males, and 6·01 per 1,000 females.\* These numbers are considerably in excess of the standard rate of mortality from the same diseases,† and they especially present an unfavourable contrast to the mortality in some of the colliery districts of Durham.‡ The chief difference between Merthyr Tydfil and Abergavenny consists in the fact, due to the geology of these districts, that whilst in the former the towns of Merthyr Tydfil, Dowlais, and Aberdare, form, as it were, the centres of the mining and manufacturing operations, these are carried on in the latter district at hamlets in the hills, more or less remote, on the west and south-west sides of the town of Abergavenny. So far as their peculiar industrial pursuits are concerned, these two districts may very properly be regarded as one and the same district.

The iron smelting and manufacture are usually carried on in the immediate neighbourhood of the mines, which are situated in a series of nearly parallel valleys running in a southerly direction, or on the neighbouring hill-sides. The mining operations of this district, especially those in the valley of Aberdare, have been so rapidly developed of late years §, that the miners do not constitute so definite a class as in districts where mining has been the staple form of industry for many generations. Miners have migrated in large numbers into this district; and many agricultural labourers, induced by higher wages, have abandoned their more healthful and agreeable occupation on the surface of the earth to dig for minerals under ground. These men, who are usually of a ruddy and healthful aspect when presenting themselves for employment at the mines, soon, it is said, lose their florid complexion, and become pallid and etiolated after working for some time as miners. There is much diversity of character in the houses occupied by the miners and operatives of Merthyr Tydfil and Abergavenny. Many of them are built back to back, or otherwise in such a manner as not to admit of thorough ventilation. In the older parts of Merthyr Tydfil, and in some of the outlying hamlets of Aberdare, as at Hirwain, the cottages are small, and the bed-rooms, especially, too confined in proportion to the number of inmates. The same observation applies to many of the cottages in the neighbourhood of Rhymney. In other respects the houses are usually of fair dimensions, and rarely overcrowded, though the bed-rooms are often very close and unwholesome, owing to the want of sufficient means of ventilation. This is, no doubt, partly attributable to the construction of the houses, but also largely to the habits of the people, who, while they usually keep the street door wide open, admit a very insufficient amount of fresh air into their sleeping apartments. In most of the houses there is a very small bedroom on the ground floor entered through a doorway from the parlour or kitchen. These bed-rooms in some comparatively new houses in Dowlais contained on

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\* See "Papers relating to the Sanitary State of the People of England," p. 68.

† For the standard rates of mortality see foot note pp. 138-140.

‡ See ante, p. 154.

§ Owing to the great development of mining industry the population of Aberdare rather more than doubled in number between 1841 and 1851.



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an average 720, and in older houses rather less than 450 cubical feet of breathing space. The bed-rooms up-stairs, usually two in number, are entered one through the other; and the dark staircase by which they are approached being shut by doors at both ends, they are ventilated only by means of the window and a single chimney, only one of the rooms having a fire-place. The two up-stairs bed-rooms taken together contain, on the average, not more than from 1,700 to 2,000 cubical feet of space.

The situation of most of the mining hamlets, mines, and iron works is elevated, exposed, and bleak; and cold wet weather prevails much during a considerable portion of the year. Each of the great mining and manufacturing establishments has its resident medical attendant, who has, of course, peculiarly favourable opportunities for becoming acquainted with the prevalent diseases of the community committed to his care. Several of these gentlemen are extremely intelligent and well informed, and they, as well as the private practitioners of the neighbourhood, reported that they had observed the great prevalence of pulmonary diseases among the population. As was also stated at Wolverhampton, the furnace-men, puddlers, and other persons employed in the immediate neighbourhood of the fires in the ironworks, are said to become prematurely old. Hence they are compelled to discontinue such labour at a comparatively early age, but are still frequently able to perform work of a lighter nature for many subsequent years. Pulmonary diseases are said to be by no means restricted to any particular class or age; but eleven medical practitioners, connected with great mines and ironworks, who kindly gave information on the present subject of enquiry, all agreed in saying that ironstone miners and colliers suffer much more largely from these diseases, in proportion to their numbers, than the rest of the community. The colliers are said to suffer from bronchitis and asthma, the miners chiefly from consumption, which also prevails largely among the girls employed at the mines. Thus, Mr. Davies of Aberdare said that many of the older colliers are asthmatical, and that a miner is comparatively an old man at 50 years of age. Mr. Instan, of the Cyfarthfa works, said that asthma and bronchitis are very common diseases among the colliers, and that more acute pulmonary disease is common among miners. He added that these diseases usually commence at some time between the ages of 30 and 45 years, but that men were, nevertheless, often able to continue working for many years longer; some until the age of 60. Miners and colliers, according to the same authority, are so predisposed to diseases of the chest, that causes, which would only induce a slight attack of catarrh in most persons, will produce serious illness in them. Mr. Dyke, a private practitioner in Merthyr Tydfil, who has medical charge of a portion of the miners employed at the Dowlais ironworks, stated that miners generally die prematurely, that they often become ill at about 40 years of age, and die ten or fifteen years later of long-standing chronic pulmonary disease, aggravated from time to time by intercurrent attacks of a more acute nature. Mr. Probert, resident surgeon to the Plymouth works, reported that a large proportion of the miners suffer from asthma as they advance in life, and that there is but a small proportion of old men among the miners or colliers. The miners, being a more orderly class of men, and especially more temperate, upon the whole suffer less than the colliers. Mr. Steele, of Blaenavon, whose medical experience in the district extends over a period of 22 years, said that miner's asthma is common among both pitmen and miners, more particularly among the former; but that in consequence of the great improvements lately introduced in the ventilation and management of the mines, this disease is now less common than formerly. Most of the medical men considered working in



ill-ventilated mines, the atmosphere of which is charged with dust and powder smoke, as the chief cause of the prevalence of pulmonary disease among miners; but several of them also attributed its existence partly to the nature of the climate, and to the alternations of temperature to which the miners are exposed on leaving their over-heated dwellings for the cold and often damp atmosphere out of doors. Indeed, it was asserted that very frequently the first accession of serious illness may be traced to a severe attack of catarrh. Mr. White, of Cardiff, in particular, who was for many years resident surgeon to the Dowlais ironworks, attaches great importance, as regards the causation of the pulmonary diseases prevalent among miners, to the inclemency of the climate, and especially to the circumstance that the men have to walk some distance to and from the mines. On leaving the mines, miners are often in a profuse perspiration, and, being exposed while in that condition to the bleak and often damp atmosphere of the hills, are continually taking cold, which lays the foundation of subsequent illness. Mr. White suggests that a well-warmed shed near the mouth of each pit, where the men might change their wet clothes before returning homewards, might be of service in counteracting the danger incidental to their exposure to the inclemency of the weather after leaving the hot mines. This plan has been found so useful in Cornwall,\* where it is now commonly adopted, that it seems at least to deserve a trial at these mines likewise. But although it may be true that the ungenial climate aggravates the pulmonary diseases of the miners in this district, or that an attack of catarrh is frequently the apparent beginning of their ailments, sufficient proof was obtained that the miners here, as in some other districts previously reported upon, suffer from pulmonary diseases chiefly in consequence of and in proportion to their exposure to certain definite conditions during their period of labour in the mines. These conditions are identical in their nature, though different in detail, to those already described as so noxious to the miners of the Wolverhampton District.

There is much diversity in the character and mode of working these mines. Sometimes the coal and ironstone are worked through different, at others through the same shaft. Some of the mines are large and deep; others very small and shallow; and the latter are, for the most part, the worst ventilated, and the most injurious to the health of the miners. A few of the mines are worked by levels entered from the surface, being, in this respect, analogous to the lead mines of Yorkshire and Durham. The ironstone is almost exclusively and the coal largely worked by means of blasting with gunpowder; hence the atmosphere of the mines is often loaded with smoke and the other products of combustion. It was said that in some mines the smoke is rapidly carried away by the ventilating current, while in others it lingers for a long time. It was distinctly stated of one mine that the smoke is swept away from the face of the work, where the men are most exposed to inhale it, in a few minutes after the explosion, whilst the atmosphere of other mines was said to be scarcely ever free from smoke, which only disappeared by what the miners expressively call "dying away." The miners employed in the former were reported, by the manager, the surgeon, the overman, and by some of the men themselves, to be nearly exempt from miner's asthma; while it was ascertained of some of the latter, that almost all the men become asthmatical as they advance in life. These are, indeed, extreme cases, the one being the best and the others probably among the worst ventilated mines in the district; but there are also other mines of every intermediate variety as regards the efficiency of their ventilation. The ironstone mines of this district are, in general, less perfectly ventilated

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\* See "Third Report of the Medical Officer to the Privy Council," Appendix VI., p. 132.



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than the coal pits; partly, perhaps, because being nearly exempt from fire-damp there is no danger of explosion; but partly also, it is said, because the mineral could not be profitably wrought if the cost of efficient ventilation were added to that of working the ore. Probably another reason is, that, while coal mines have been under Government Inspection for many years, ironstone mines have only been recently placed under the superintendence of Her Majesty's Inspectors. The system of ventilation by "up-cast" shafts, in which the upward current of air is ensured by means of furnaces, is employed in all the larger collieries and in some of the ironstone mines; but in many of the latter, the air finds its way as it best can, and its direction is liable to be influenced by the state of the external atmosphere and the other circumstances already described in the Report on the Wolverhampton mines. In some of the mines much reliance, as regards ventilation, is placed upon the circumstance that the strata dip very much, and hence the shafts at the higher level generally serve as "up-cast" shafts. Much, however, must depend upon the length and intricacy of the workings, and the amount of friction to which the current of air is exposed in its course between the "down-cast" and "up-cast" shafts. Upon the whole, the ventilation of these mines, with a few exceptions, may be regarded as inferior in efficiency to that of the Northern coal mines, and better than that of most Cornish and lead mines.\* This opinion derives support from the statement of two "viewers" from the neighbourhood of Newcastle-on-Tyne. One of these, who had been for some years agent for a very large mining property, said that the mines here are, with certain exceptions, less perfectly ventilated than those in the North of England, adding that more asthmatical disease exists among the miners here than in that neighbourhood. The other, who had been in charge of some mines near Abergavenny during several years, distinctly affirmed that miner's asthma is more common in this district than in the North, where it is rare, and that the mines here are much less perfectly ventilated than the Northern mines. Ventilation in the mines under his charge is less absolutely necessary for the protection of the mines from explosion, there being less fire-damp in these than in the Northern mines; but there is more black damp, that is to say, carbonic acid gas, and the atmosphere is more vitiated by smoke from the use of gunpowder for blasting the coal. On the other hand, a mineral agent at Merthyr Tydfil, well acquainted with the Cornish mines, said that the mines of this district are much better ventilated than those of Cornwall, and that the miners are a much less unhealthy set of men than the Cornish miners.

Various incidental circumstances tend to aggravate the danger occasioned by imperfect ventilation. In the dry parts of mines there is much dust in the atmosphere, which being inhaled tinges the expectoration of a dark colour, and of course has a tendency to excite irritation of the pulmonary mucous membrane. The men pass much time under ground, and, without getting through more work, are sometimes twelve or thirteen instead of seven or eight hours in the mine, which is the usual period in other districts. Many of the mines are worked in the manner described in the Report on Wolverhampton as the pillar and stall mode of working, which, for reasons there assigned, is unfavourable to ventilation. It was alleged on all hands by the managers, agents, and miners, that great improvements have

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\* Among other aids to ventilation should, perhaps, be included the disturbance caused in the atmosphere of mines by the passage of the trams, and even the passing to and fro of the miners. As, however, these are common to all mines, they appeared to require no special notice in the text.



been effected in the ventilation of these mines since they were brought under official inspection, and especially that more care is taken to carry fresh air well up to the place where the men are at work. One of the viewers, already mentioned, said that when he undertook the superintendence of the mines, five or six years ago, he found only one small ventilating shaft, provided with a furnace, to ensure a constant upward current of air; but that, finding this quite insufficient, he has now five similar shafts, provided with furnaces, in operation. This fact may be regarded as an illustration of the kind of improvements that have recently been introduced, all of which have had for their object the ensuring a more constant and regular current of air through the workings by means of the artificial rarefaction of the outward current by means of heat. Nevertheless there evidently yet remains much to be effected in this respect, particularly in the ironstone and the smaller coal mines. Many of the older miners confirmed this statement of the improved condition of the mines as regards ventilation, saying that the mines are much less injurious to health than they were, and that miner's asthma is not so common as formerly.

Besides the evidence obtained from "viewers," mineral agents, managers, and other superior officers of mines, several of the men were examined at each mine visited during the inquiry. Out of 53 miners of both kinds who gave evidence, 29 were suffering, more or less, from bronchial irritation caused by the nature of their work, 20 declared themselves to be in good health, and 4 gave no definite information as to their state of health. Of the 29 who were ailing, 13 were under medical treatment, and were brought under notice by the surgeons as examples of miner's asthma. Several of these were permanently disabled from working in the mines, though one or two were still able to do light work above ground. Excepting that older men were preferred, the remaining 40 miners were taken indiscriminately as they were met with at the mines or at their homes, and their statements were confirmed in every respect by the managers and inferior officers of mines. Of those men who were suffering more or less severely from pulmonary disease induced by working in the mines, one was above 70 years of age, ten between 60 and 70, nine between 50 and 60, four between 40 and 50, and three between 30 and 40 years of age. One had been ill 22 years, another 14, and the rest for different periods under 14 and exceeding 3 years. Of the healthy miners two were above 70, four between 60 and 70, eight between 50 and 60, six between 40 and 50, five between 30 and 40, and one between 20 and 30 years of age. Many of the men examined had begun to work in the mines as boys between 7 and 13 years of age. A few had adopted the calling after reaching manhood. From the ages both of the miners who were sick and of those who were well, it is evident that these miners do not suffer either so commonly or so early in life as the Cornish and lead miners, but they agree with the latter in the chronic and very protracted duration of the illness to which they are liable, and in being often able to work on the surface of the earth for many years after being disabled for working in the unwholesome atmosphere of the mines.

There was, as might have been expected, much diversity of opinion among the miners respecting the influence of their occupation upon health. Most of them either spoke decidedly of the prevalence of pulmonary disease among their class as a fact that came under their daily notice, or when, as sometimes happened, they asserted that the mines in which they themselves worked were healthy, they added that the workers in other mines suffered from miner's disease. A few confidently asserted that miners are as healthy a race as the rest of the community. The miners attributed their ailments chiefly to work-

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ing in ill-ventilated places. One man, aged 60, had been suffering from severe miner's asthma for three years ; having previously been in good health his illness was brought on by working for some time in foul air, which he had never done before ; and, the disease being once established, he had never since been free from dyspnœa, cough, and expectoration. Several younger men gave similar evidence, referring the commencement of their ailments to working in a close atmosphere, impregnated either with carbonic acid gas disengaged from the strata, or with the smoke and other products of the combustion of gunpowder consumed in blasting.

The disease from which the colliers and ironstone miners of this district suffer is analagous to that of the Cornish and lead miners, described in last year's Report,\* and it runs a very similar though milder course. This disease is chronic bronchitis and its results ; but, judging from the cases examined, emphysemæ appears to be rather more frequent, and pneumonia, followed by breaking down of the pulmonary tissue, less common here than in the above-mentioned districts. The disease is also, upon the whole, developed later in life here, and is more often immediately referable to working in some particular mine or part of a mine, such as an unventilated "heading." The miners of Merthyr Tydfil and Abergavenny also do not habitually suffer from slight dyspnœa, as is the case with many of the Cornish and lead miners from an early period of life. As in the latter districts, so here likewise, the immediate attack of illness is generally attributed to cold ; a catarrhal attack frequently leading to the development of symptoms which had previously been so slight that the miner, being still able to continue his employment, had paid no attention to them. Accordingly, when a distinct history of the case could be procured, it was generally found that dyspnœa existed before either cough or notable expectoration, these having generally come on as the result of a catarrhal attack, some time after the miner's breathing had become more or less laboured, especially in going up hill. Slight hæmoptysis is of common occurrence, but only one case came under notice in which there had been copious hæmorrhage from the lungs. Occasionally, where men have for some time ceased to work under ground, the habitual cough and expectoration disappear, but return from time to time, during attacks of catarrh, to which they usually continue very subject during the remainder of their lives. When dyspnœa has been once fully established it is commonly persistent. Mr. White, of Cardiff, says that disease of the heart, anasarca, and effusion into the serous cavities, are frequent terminations of chronic bronchitis in miners. This might have been anticipated, seeing that these are common consequences of long standing chronic bronchitis in ordinary subjects ; but it is remarkable that none of the cases examined presented these complications or rather results of the bronchitic affection. Moreover, Mr. Dyke, who has had extensive practise in Merthyr Tydfil and its neighbourhood for a great number of years, said that dropsy is a rare result of the miner's disease. In reference to this disease it seems quite certain, from the evidence adduced, that it is much less prevalent than formerly ; a result, as was distinctly stated by many witnesses, of the official inspection of coal mines. It may be hoped that the recent extension of inspection to the ironstone mines of the coal measures may likewise tend to lessen the frequency and fatality of a disease which might evidently be almost if not altogether prevented by the more perfect ventilation of mines.

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\* See Third Report of the "Medical Officer of the Privy Council," Appendix VI., pp. 132-5 and 142-5.



COVENTRY.—*Silk Manufacture and Watchmaking.*

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The manufacture of ribbons and other silk fabrics, and of watches, constitute the staple employment of the people of Coventry. A portion of the population is likewise engaged in occupations subordinate to these principal manufactures, and there are, of course, a large number of persons employed in the several professions and trades necessary for supplying the daily necessities of a considerable city population. Besides the above there are likewise a plush factory, a coach-trimming factory, an ecclesiastical brass and metal work factory, several large steam flour mills, and, probably, other manufactories, which however important individually, employ comparatively so few operatives that their deaths can scarcely produce any appreciable effect on the general mortality of the city. Practically speaking, silk weaving and watch making are the employments which call for special investigation in relation to the influence of industrial labour on health in Coventry. The number of persons employed in each of these staple manufactures at the time of the late census has not yet been ascertained, but 34 per cent. of the men and 44 per cent. of the women aged 20 years and upwards were employed in the silk manufacture in 1851, and rather more than 11 per cent. of the men, of the same age, in the manufacture of watches. Very few women are employed in watch making, but some of the female members of watchmakers families are accustomed to work in the silk factories. Many apprentice lads work in the watchmakers factories and shops, and many young people of both sexes in the silk factories. In addition to the female operatives employed in factories many women and children are engaged at their homes in winding and filling shoot for the silk weavers.

The mortality from diseases of the lungs of all kinds, including phthisis, in Coventry, during the seven years 1848-54, was at the average annual rate of 6.61 per 1,000 males, and of 5.73 per 1,000 females, without distinction of age.\* The rate of the subsequent period cannot be accurately estimated until the publication in detail of the results of the last census ; but, judging from the number of deaths in each of the last ten years, there does not appear to have been any essential improvement since the year 1854. The annexed Table shows the number

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Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	70	29	33	7	12
1852	69	32	47	14	7
1853	92	43	50	19	9
1854	59	40	41	11	10
1855	75	34	38	20	15
1856	71	33	44	14	12
1857	79	33	45	12	16
1858	78	37	36	11	17
1859	94	40	48	13	12
1860	109	40	48	21	16
Totals -	796	361	430	142	126

\* See "Papers relating to the Sanitary State of the People of England," p. 76.

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of deaths from pulmonary diseases, exclusive of phthisis, in children under the age of five years, and also the number of deaths in each of the last ten years from phthisis and other diseases of the respiratory organs in males and females above the age of 15 and under that of 55 years, being that portion of working life which is anterior to the time when diseases consequent upon the approach of old age begin to be developed. The rate of mortality from pulmonary diseases in Coventry is thus considerably higher than the standard rate,\* and yet it contrasts favourably with the corresponding rates of Macclesfield and Leek, especially among the female population; the rate of mortality from these diseases among the female inhabitants of Coventry being lower, while those of Leek and Macclesfield are considerably higher, than the rate among males. The rate in Coventry being, as has just been said, 6·61 per 1,000 males, and 5·73 per 1,000 females; that of Macclesfield is 7·43 in the former, and 8·13 in the latter; that of Leek 7·80 per 1,000 males, and 8·51 per 1,000 females.\* This fact is the more remarkable, seeing that the article of manufacture in which females are employed is the same in each of the three districts, and that there is nothing necessarily injurious to health in the ordinary processes of the silk manufacture. The difference in the rate of mortality, as will presently appear, is probably due, in a great measure, to the larger proportion of females employed in hand-loom weaving in Macclesfield than in Coventry, and to the stooping position of the piecers while at work, and the exceedingly close ill-ventilated and often over-crowded state of the work-places in Leek.

The city of Coventry is not densely built upon the surface of the soil; it contains many open spaces, and the courts inhabited by the labouring classes are, with a few exceptions, to be found in the older part of the town, large, open, and well ventilated. Some of the dwellings of the labouring classes are small, dark, ill ventilated, dirty, and occasionally built back to back, the rooms low, and the staircases gloomy, dark, and only ventilated by means of their communication with the kitchen or bed-rooms. Such houses are, however, only met with in the more densely built and older portion of the city; and by far the greater number of the cottages, including all those of recent construction, are of a superior class, having ventilation from front to back, by means of doors and windows; and the latter, being in all cases made to open freely, are capable of admitting plentiful supplies of fresh air. The rooms are of ample height, and contain on the average 1,000 cubical feet of space; but the staircases are, for the most part, as in the older houses, dark and ill-ventilated. The houses of the working classes are, for the most part, kept in a cleanly state; indeed the newer parts of the town and suburbs, such as Hill Fields, where the cottage factories are chiefly situated, the streets immediately adjacent to Butt's Lane, also mostly inhabited by operatives, and Chapel Fields and Earlsdon, the principal watch-making districts, are nearly unexceptionable, the houses being all well drained, the situations airy, and almost every house having a portion of garden ground attached to it.

*Silk Manufacture.*—Until within the last 10 or 15 years most of the silk fabrics of Coventry were made in the houses of the operatives. A few “A-la-bar” looms were in use, but by far the greater part of the weavers worked with the hand loom. Now the factory system has been generally adopted; but it possesses one feature peculiar to Coventry, viz., that while a large portion of the work is done in large factories,

\* For an account of the standard rate, see foot note pp. 138-140.

† See “Third Report of the Medical Officer to the Privy Council,” Appendix VI. p. 154.



as in the cotton and woollen districts, a considerable portion is likewise done in what may be termed cottage factories. These consist of cottages, arranged either in rows or quadrangles, each having a workshop in its top story, in which several, sometimes as many as five or six, power looms are placed. The power for working these looms is afforded by a steam-engine in the immediate neighbourhood, which supplies power enough for a considerable number of such cottages. The steam engines attached to these cottage factories are regulated, as regards the hours of work, by the provisions of the Factory Act, which applies to all these workshops, and the cost of the steam power is included in the house rent. In many cases only the members of one family work in these cottage factories, of which there are said to be several hundreds in Coventry, but in some instances additional assistance is procured from out of doors. At the time of the inquiry which forms the subject of the present Report, the trade of Coventry was much depressed, several of the larger factories being closed, and of those at work few were in full employment. A large proportion of the cottage factories were also unemployed, and in several cases the adjoining workshops of several cottages had been thrown together, so as to form a small factory of the ordinary kind.\*

In the opinion of some of the managers of factories, the health of the silk operatives as a class has much improved since the introduction of the factory system, it being said that the operatives now lead a less sedentary kind of life, and that the employment of power looms has greatly reduced the number of hand-loom weavers, who formerly sat leaning over their work, and, as at Macclesfield, pressing the chest against the "breast-beam."† Each power-loom requires two attendants; one, a "watcher," generally a man whose duty consists in walking to and fro in front of the loom, to see that the quills of "shoot" are right, and to rectify them when wrong; the other, a "cleaner," usually a female, who attends behind the loom to clean the silk. The factory rooms of Coventry are, for the most part, warmed by means of steam pipes; they are rarely overcrowded, the only rooms in which this occurs being the "winding" and "filling" rooms, where the silk is wound on to the shoots, in order to be ready for the weaver. In one of these rooms, where 30 women and children were at work at the time of visit, the cubical space per head was barely 100 cubical feet; in another, where there were 17 persons at work, it was 190; in a third, 240; in a fourth, with 60 operatives, 280; in a fifth, 480; and in a sixth, where upwards of 50 persons, chiefly young girls, were employed in a somewhat different process, there were 345 cubical feet of breathing space per head. Several of these rooms were imperfectly ventilated, and hot, close, and unpleasant at the time of visit. In one instance, where the breathing space amounted to 280 cubical feet per head, the only ventilation was derived indirectly through an adjoining room. In others of these winding rooms the ventilation was effected by means of casements, consisting of one or more panes, placed so near to the floor as to produce draughts intolerable to the operatives when open. In a few instances there were openings in the brickwork near to the ceiling, but

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\* The depressed condition of trade in Coventry last autumn may be in some measure estimated by the circumstance that, notwithstanding many of the operatives had found employment in harvesting, there were, in the month of September, more than 300 inmates in the workhouse, the usual number being from 150 to 200, and, at least 2,600 persons in the receipt of out-door relief, the average of better times being only 400. This, however, fails to convey a just idea of the privations endured by the operatives, in consequence of the failure of the ribbon-trade, many of the better sort of operatives having contrived to struggle on without parochial assistance.

† See the Report on Macclesfield published in Appendix VI. to the "Third Report of the Medical Officer to the Privy Council," p. 159.



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as the operatives could shut these up at pleasure, they were generally found closed. In one room, where about 50 children were at work, the ventilation was effected by means of well-contrived casements, and of ventilators in the brickwork above each window. The atmosphere of this room was neither close nor unpleasant, and the children who worked in it had a cheerful healthy aspect.

The weaving-rooms of the silk factories are never overcrowded. They must be lofty on account of the height of the jacquard looms, and the machinery occupies so much room as to ensure ample breathing space for the operatives. Some mode of ventilation is provided in all of them; but it is often inadequate, and rarely in operation, in consequence of the arrangements being such as to cause draughts of air, of which all factory operatives are very intolerant. The mode of ventilation differs in the several factories; in one of the best ventilated there were casements in each window, which opened at a sufficient height from the floor, to obviate the annoyance caused by currents of air striking against the heads of the operatives, and also grated openings in the walls near the floor. It is true both the casements and ventilating apertures were capable of being closed in winter or inclement weather, but they were said to be rarely all shut at the same time, and when the gas was lit in the evening many of them were reported to be habitually kept open. In another factory there were grates in the floors of the upper rooms, admitting free communication between the atmosphere of the several rooms; the only other mode of ventilation being by means of casements of a single pane in each window, situated at the height of three feet from the floor, which were consequently practically useless, the draught produced when the casements were open being unendurable. These casements were accordingly all found closed at the time of visit, and the rooms were exceedingly hot and close, the upper ones being of course hotter than the lower, the difference of temperature between the topmost room and that on the ground floor amounting sometimes, it was said, to 15 degrees. This statement applied to times when the sun was shining brightly in summer, or when the gas was lit, and all the casements were closed in winter. In another factory the ventilation was likewise effected by means of very small casements consisting each of a single pane of glass, and by openings in the walls near the top of the rooms; but though these were all open, the rooms were oppressively hot. The foregoing facts represent the ordinary state of the silk factories of Coventry as regards ventilation. One or two factories were perhaps worse ventilated than those here described; one only of those seen was better. In this there were casements in each window, above the heads of the operatives, and also ventilating shafts through the roof. The rooms in this factory were agreeably cool, and the atmosphere quite pleasant; but they were said to be hot in winter, when the gas is lit, and, as sometimes happens, all the ventilating apertures are closed.

It was not possible to obtain any direct evidence of the influence exercised by these ill-ventilated factories on the health of the operatives; but the secretary of a sick-club, consisting of 90 members, all of whom were employed in the same factory, reported that, upon an average of six years, about 40 had annually required medical advice, *though* by no means so large a number drew sick money, the men not being in the habit of drawing on the funds of the club for an illness of merely a few days duration. In another factory, affording employment to 256 persons, viz. 117 males and 139 females, there were in one year, but that not a recent one, 70 males and 99 females requiring medical assistance. Out of these only 12 males and 21 females received



sick-pay from the club. The year referred to was not particularly unhealthy, but happened to be the only one for which accurate returns could be procured. Information could not be obtained from any other clubs; in fact very few of these societies were in existence at the time of the inquiry, in consequence of the depressed state of trade.

The cottage factories of Coventry may be said to be never overcrowded. In consequence of the height of the jacquard looms the workshops are at least 13 feet high, and the size of the looms secures to the inmates an adequate amount of breathing space per head; but the mode of ventilation is commonly imperfect, and consists almost exclusively of casements, which are closed in cold or stormy weather, and not always freely opened on fine days. These rooms are, for the most part, warmed by means of moveable stoves, furnished with narrow tubular chimneys which are incapable of affording much aid to ventilation, and lit by gas, which renders them very hot in the after part of the day. The atmosphere of many of these rooms was almost stagnant when they were visited, and very hot and oppressive, though the amount of cubical space per head varied from 420 to 640 cubical feet.

The evils incidental to the silk manufactures of Coventry are similar to those which exist in Macclesfield and Leek: neither dust nor flue is given off in the process of manufacture; and there appears to be no reason why the operatives should not enjoy good health, excepting that their work-places are often over-heated, and generally ill ventilated. In one factory at Foleshill, a village  $2\frac{1}{2}$  miles distant from Coventry, the ventilation had been for some time effected solely by means of window casements, which were generally kept closed by the operatives. The heated atmosphere, when the gas was lit, during the previous winter, had, however, so much injured the pattern cards used in weaving with the jacquard loom, that it had been found necessary to make openings for ventilation through the ceiling. This mode of ventilation was only on trial, and its permanency would depend on its successfully preventing the damage done to the machinery. The danger to health from respiring a heated and highly-dried atmosphere appears never to have occurred to the manager as a sufficient cause for improving the ventilation, though he stated that he often felt much stuffing and oppression of the chest when in the weaving-rooms at night. The overlookers or managers of one or two other factories also mentioned the imperfect ventilation of the work-rooms as a cause of discomfort to the respiratory organs. In fact, both the importance of proper ventilation in factories, and the best mode of effecting it, are at present but ill understood.

The local authorities of Coventry have shown much energy in carrying out sanitary improvements, few places indeed existing where so much has been attempted for the improvement of the public health. According to the bye-laws of the corporation all newly-constructed factories must be provided with means of ventilation, to be approved of by the Local Board of Health. Nevertheless a factory which had lately been erected under the supervision of the local authorities was found to be inadequately ventilated. The rooms were hot and close, and the ventilating openings in the windows so placed as to render their habitual use impossible, from the inconvenience occasioned to the operatives by draughts of cold air entering upon a level with the head and face. Although the evils connected with the silk factories in Coventry are similar to those found in Leek and Macclesfield, they are certainly not so great, the mills of the former being more spacious than those of the latter towns, and the operatives being subject neither to

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the bad effects of stooping over the hand-loom, a custom so prevalent in Macclesfield, nor to those of working at too early an age, a practise so common in the winding-rooms at Leek.

*Watchmaking.*—The watchmakers of Coventry are a very intelligent set of operatives. They are said to be much subject to indigestion, and winter cough or chronic bronchitis is very common among them. They, no doubt justly, attribute both these ailments to their sedentary mode of life, and the stooping attitude they are obliged to assume while at work; but the pulmonary affection is also unquestionably partly ascribable to the highly-heated dry atmosphere, the overcrowding and imperfect ventilation of their workshops, and perhaps also partly to exposure to the cold and damp air on their way to and from the heated workshops. Dr. Powell, senior physician to the Coventry and Warwickshire Hospital, expressed a very confident belief that phthisis is very common among this class, and considered their exposure to cold while in an overheated condition as a fruitful exciting cause of this disease. Excepting the stooping posture while at work, there is nothing essentially injurious to health in the kind of work done by the Coventry watchmakers, which chiefly consists in putting together the works of watches, the component parts of which are made in other places. A little filing is required, but none of the watchmaking processes carried on in Coventry occasion much dust. Few of the watchmaking establishments can be called factories, the greater part of the work being executed in small workshops attached to the dwellings of the manufacturers. There are in fact only one large and three or four smaller factories; but there are a great number of small shops, in which from two or three to eight or ten persons are employed. The principal factory is provided with various appliances for promoting ventilation, such as shafts through the roof, ventilating grates in the walls, and casements in the windows. The smaller factories and workshops are, for the most part, very inadequately provided with means of ventilation, and are also often overcrowded. In the workshops of one small factory, affording employment to 30 artisans, the space per head amounted to 245 cubical feet. In another, with the same number of hands, consisting chiefly of youths, the space per head at the time of visit fell rather short of 180 cubical feet. Ventilation was provided through the ceiling, as well as by means of open windows; but it was very inadequate to the requirements of the inmates, and became more so in the evening, when each workman requires to have a lighted gas-burner for his particular use. In some of the smaller shops the cubical space was even less than in the above-mentioned instances, in proportion to the number of workpeople. In one shop, where three persons worked, the cubical space per head was 373 cubical feet; in a second, with three workmen, 288; in another, which contained twelve operatives, it amounted to 240; in a fourth, with eight operatives, to 228; in a fifth, with eighteen, to 224; in a sixth, to 220; in a seventh, with seven operatives, to 155; in an eighth, with five operatives, to 145; in a ninth, with eighteen operatives, to 144; and in a tenth, with nine operatives, to only 140 cubical feet of breathing space for each individual. In all these shops gas is largely consumed after dusk, as each operative requires a separate light; a circumstance which of course not only tends to heat but also to vitiate the air, and render it unsuitable for respiration. The temperature of some of these shops is said to be often as high as 80° in a winter's evening after the gas has been lit for several hours; and this, though it is usual to extinguish the fire in the stove as soon as the gas is lit. In some of these shops the only mode of ventilation is by the windows, which are usually so constructed as to open very freely, but



from the situation of the casements they can only be opened in fine summer weather, on account of the draught they produce when open. In others, there are grated ventilating apertures through the ceiling, and, in a few instances, through the walls likewise; but the latter are of rare occurrence. Youths are taken as apprentices to the watchmaking trade at 14 years of age, when they are usually bound for seven years, thereby making them freemen of the city at the expiration of their apprenticeship. A large proportion of the hands employed in the watchmakers shops are apprentices.

The great prevalence of pulmonary diseases among the inhabitants, and especially among the operative classes of Coventry, had been observed by the resident medical practitioners anterior to the enquiry upon which the present Report is founded. Dr. Powell, who had given much attention to the subject, distinctly affirmed that he regarded these diseases as ascribable to circumstances connected with the industrial labours of the people, and especially to the over-heated, ill-ventilated state of many of the workplaces. Dr. Overton considered it to be mainly attributable to exposure of the operatives to the inclemency of the weather in going to and returning from their work. On the other hand, it was asserted by a highly intelligent factory manager that the operatives, as a class, have been healthier since they worked in the factories, and that the prevalence of pulmonary diseases especially has decreased. This opinion was, it is true, unsupported by evidence, but it is at least certain that the mode of labour in the factories is in itself less injurious to health than hand-loom weaving, provided the other arrangements were unexceptionable. It was found impossible to obtain such direct evidence of the injurious influence of the occupations of Coventry on health as in those districts where the processes of labour are accompanied by very definite circumstances directly injurious to health. But, although less demonstrable than the causes of pulmonary disease among miners, grinders of cutlery, flax hacklers, and potters, there can be no doubt that the prevalence of these diseases in Coventry is really in a great measure to be attributed to the ill-ventilated workplaces, aggravated, in the case of the watchmakers, by the sedentary nature of their employment, and their posture while at work.

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BLACKBURN.—*Cotton Manufacture.*

## Blackburn.

The cotton manufacture forms the staple occupation of the inhabitants of Blackburn. It afforded employment to 42·6 per cent of the men, and 35 per cent. of the women, above the age of twenty years in 1851. A considerable number of young people of both sexes under twenty years of age likewise find employment in the mills. A small proportion of the men are colliers, but as they only formed 2·7 per cent. of the adult male population in 1851, their number is too inconsiderable for their deaths to have any appreciable influence on the general mortality. Besides the ordinary cotton mills there are in Blackburn several mills in which waste cotton and shoddy are worked up, and also some print-works. These manufactures are not restricted to the town of Blackburn, but extend throughout the district, mills being met with in most of the outlying villages and hamlets. The inhabitants of Over Darwen, a town in the registration district of Blackburn, and about four miles from the town of the same name, are likewise almost exclusively employed in the cotton manufacture. The mortality from pulmonary diseases of all kinds, including phthisis, in the registration district of Blackburn, was at the average annual rate of 7·08 per 1,000 males, and of 7·34 per 1,000 females, without distinction of age, during

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each of the seven years 1848-54.\* These figures are very much in excess of the standard rate†, and plainly point to the existence of some special cause of these diseases among the population of Blackburn.

The annexed table shows the number of deaths from diseases of the respiratory organs, exclusive of phthisis, in children under the age of five years, and from phthisis and other diseases of the respiratory organs in males and females respectively between the ages of 15 and 55 years, in each of the 10 years 1851-60. The proportion which these deaths bear to the population of the same ages cannot be accurately computed until the publication of the results of the last census.

BLACKBURN.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	163	107	130	18	25
1852	163	87	159	29	29
1853	236	129	151	29	25
1854	182	104	138	25	29
1855	246	116	158	50	45
1856	203	106	172	34	25
1857	264	112	165	38	41
1858	229	100	171	33	48
1859	244	86	156	45	38
1860	297	105	160	41	38
Totals -	2,227	1,052	1,560	342	343

The great prevalence of pulmonary diseases among the inhabitants of Blackburn had not escaped the notice of the resident medical practitioners. Mr. Wraith, of Over Darwen, certifying surgeon to factories, and also parochial medical officer for that district of the Blackburn union, had observed for more than twenty years the great prevalence of bronchitis and phthisis. He had especially noticed that operatives employed in the carding-rooms suffer from these diseases, and he attributed the circumstance to their inhaling dust and flue. Mr. Skaife, certifying surgeon to factories for the town of Blackburn, confirmed in the main Mr. Wraith's statement, but spoke more particularly of the great frequency of both acute and chronic bronchitis, which he believed to be due chiefly to the cold moist climate, adding that chronic bronchitis is exceedingly common among old factory hands. Dr. Grimes, one of the parochial surgeons of Blackburn, who has had a very extensive practice during many years among the factory operatives, said that pulmonary diseases, in the forms of phthisis and pneumonia, are the most prevalent complaints among younger persons, and in that of bronchitis in persons of middle age and upwards. Dr. Grimes thinks that circumstances connected with their occupation are a principal cause of the prevalence of these diseases, which, he added, are particularly common among the card-room hands. If a lad be employed

\* See "Papers relating to the Sanitary State of the People of England," p. 78.  
† For the standard rates of mortality, see foot note pp. 138-140.



in one of these rooms from the age of 14 for 12 or 14 years, he rarely survives the age of 36 or 38 years. First of all he suffers from dyspnœa, and subsequently from cough and hæmoptysis, which terminate in phthisis. This result is the most marked in lads who have recently come from a pure country air into the district, but it is by no means restricted to such. In Dr. Grime's opinion, inhaling the dust and flue diffused through the atmosphere of the card-rooms is the primary cause of the prevalence of pulmonary diseases among this class of operatives; for although bronchial affections are more or less common among operatives of all classes in Blackburn, they are out of all proportion more frequent among those who work in the card-rooms than among the rest. He also thought that the operatives resident in the town of Blackburn suffer more from these diseases than those who live in the rural parts of the district. Dr. Martland, a very old practitioner in Blackburn, and Mr. Arkwright, of Accrington, certifying surgeon to print-works and factories, confirmed the statements previously made by the other medical practitioners respecting the prevalence of pulmonary diseases, which the former said are very common among all classes of operatives, and ascribed partly to the cold bleak climate, but mainly to exposure to atmospheric vicissitudes in going to and returning from the mills. The same reasons for the prevalence of these diseases were assigned by Mr. Arkwright, but this gentleman also attributed considerable influence to the dusty atmosphere of the work-rooms. That exposure to great vicissitudes of atmosphere may determine the accession or aggravate the severity of the bronchial affections of these operatives is not improbable, it having been directly ascertained in some of the mining districts that the beginning of miner's asthma in a severe form is often traceable to such influences; but that the cold damp climate of Blackburn is the chief cause of the great prevalence of these diseases among its inhabitants appears most improbable.\*

The cotton mills of Blackburn are usually capacious, well constructed, and not overcrowded; ample cubical space, varying from 600 to 1,000 cubical feet, being afforded to each operative. The workrooms in some of the older mills are low, but in those of more recent construction they are lofty. These rooms are almost invariably warmed in winter by means of metal pipes heated by steam; and lighted with gas, which is necessarily used for four hours daily during several of the winter months; that is to say, from six to eight o'clock in the morning, and from four to six in the evening. The ventilation, as is common in factories, is often very defective, not so much on account of the want of provision for ventilation as from this not being made use of. In many instances the method of ventilation consists of casements, of greater or less size; but these were in several instances found to be so stiff, when it was attempted to open them, as to afford conclusive evidence of the unfrequency with which fresh air had been admitted into the rooms by their means. In many mills these casements are of ample size, and placed at the upper part of the windows in such a manner that the draughts of air would enter considerably above the heads of the work-people; in others, they are placed so low that, when opened, the operatives would be exposed to a free current of air while at work. Moreover, these casements are sometimes made to open so as to admit the air without any hindrance to its blowing directly into the room; at others they open upon pivots, so that the air enters the room

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\* See the comparison made between the rural and urban districts of Preston, in last year's report. — "Third Report of the Medical Officer to the Privy Council," Appendix VI., p. 173.



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in a slanting direction, and is then less likely to prove annoying to the operatives. The mode in which these casements open is really very important as regards the health of the operatives, seeing that the latter are extremely impatient of exposure to draughts of air; and, although the casements were closed in many mills where they might have been open without causing any inconvenience, the only rooms in which they were found freely open were those in which they opened in such a manner or at such a height from the floor as precluded annoyance to the workpeople. In other mills the buttresses between the windows contain a hollow shaft extending from the ground to the top of the building, communicating freely, by means of apertures, with the work-rooms, and at its upper end with the open air. In some instances, tubes or shafts, divided into two unequal parts by a longitudinal partition, are carried through the ceiling of the work-room to the open air, and protected at the top by a moveable cowl intended to exclude rain, and yet to allow the free passage of air. These are designed to act like the "down-cast" and "up-cast" shafts of mines, the vitiated air being intended to pass up one side of the partition, the pure air to descend down the other; but, in point of fact, this does not always happen, for the same reason that the shafts of a mine do not act properly, unless the air in the up-cast shaft be rarefied by burning a fire at the bottom; and very frequently, on examination, air was found passing sometimes upwards, sometimes downwards, in both divisions of the tube at the same time. In cold weather, especially, a current of cold air is very apt to set down both divisions of these tubes, rendering it necessary to close them, and thus stop all ventilation where these alone are relied on for that purpose. The temperature in many of the factory rooms of Blackburn is high, especially in the spinning-rooms, most of which were found to be very hot, and some of them quite stifling. The exact temperature could not always be determined; but it varied much in different factories, having been found as low as 65° in one, and in others as high as from 76° to 80°. That, however, the oppressive atmosphere of many of these rooms is not due exclusively to their high temperature, is shown by the circumstance that one well-ventilated factory room was less stifling at the temperature of 76° than another visited on the same day, the temperature of which was only 65°. In the afternoon, when the gas is lit, these rooms must be even hotter and more unwholesome than in the day-time; the consumption of gas not only heating the atmosphere of the room, but also vitiating it with the products of combustion. A somewhat high temperature is said to be favourable to the process of spinning cotton, and, indeed, to be necessary in spinning "high numbers," or in other words, very fine yarn, the requisite degree of heat depending in some measure on the state of the weather; but, whatever temperature may be necessary to the manufacture, this is surely not incompatible with proper ventilation.

The several departments of a cotton factory are neither dangerous to health in an equal degree, nor exactly in the same manner. As was stated in the Report on Preston,\* drawn up in 1860, the card-room operatives suffer much more than others, in consequence of the greater amount of dust and cotton fibre diffused through the atmosphere. These rooms usually contain many operatives, sometimes even a quarter or a third of all those employed in the factory. All the operatives at work in these rooms are, more or less, exposed to inhale the dusty atmosphere, and are in consequence liable to suffer from bronchial irritation; but the card-grinders and card-strippers suffer more than the

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\* "Third Report of the Medical Officer to the Privy Council." Appendix VI. p. 174.



rest ; the former by reason of the dust given off during the process of grinding the machines, and the latter from the quantity of cotton flue and dust dispersed into the atmosphere at the moment of lifting up the wooden covering in order to strip off the cotton adhering to the carding engine. The danger to health varies much in different mills. When the card-rooms are lofty, spacious, and well ventilated, the dust and flue escape more rapidly, and are therefore present in a smaller proportion in the air of the room. There is also much variety in the degree of perfection with which the engines are covered, the wooden covers sometimes fitting very closely, at others so loosely as to allow much dust and flue to escape. It was said by a manufacturer that a large portion of the dust and flue which escapes into the atmosphere of the rooms might be intercepted and carried away by means of properly contrived flues and fans, but that the expense both of the machinery, and of additional steam power to work it, is a barrier to their being employed. As in Preston, the carding engines are sometimes ground by manual labour, at others by machines. Although, where the grinding machines are used, the grinder escapes much of the dust to which he was formerly exposed, a large portion of it still escapes into the atmosphere of the room, where, as has already been said, there are usually many other operatives at work besides the card-grinders. Here, too, as in Preston, the quantity of dust and flue given off into the atmosphere of the carding rooms depends partly upon the quality of the cotton in process of manufacture.\* Upon the whole, more dust and flue are observable in the atmosphere of the factory rooms at Blackburn than in those of Preston, though, as might be supposed, there is much difference in this respect, some mills having much less of it than others.

The card-grinders and other operatives employed in the card-rooms suffer more or less from chronic bronchitis in proportion to the amount of dust and flue diffused through the atmosphere. Much of course depends upon individual constitution; some of the operatives almost entirely resisting the influence of these mechanical irritants, while, on the other hand, those who are already predisposed to pulmonary disease speedily succumb to the unwholesome conditions to which they are exposed. One of the manufacturers, who employs a very large number of operatives, said he had observed that after men had worked continuously for some years in the card-rooms they frequently become asthmatical. The manager of another mill, in confirmation of his belief that the grinders suffer from pulmonary disease induced by their occupation, said that men who had been grinders in other mills often applied to him for employment, expressing a desire to give up this branch of labour on account of its injurious influence on health. Another overlooker, who had himself been a card-grinder, said that his health had suffered in consequence, and that nearly all the card-room operatives suffer more or less from cough and expectoration after continuing to work for a few years in the atmosphere of these rooms. Similar evidence was given by several of the card-grinders in different factories, and few or none were met with who had worked continuously for 10 or 12 years at this employment with complete impunity. Most of them had, at least, a little morning cough and expectoration, though perhaps too slight to prevent them from continuing their labour ; and several comparatively young men looked prematurely old. Although the card-room operatives are more liable than any of the others in cotton mills to suffer from pulmonary disease, those employed in the other departments are not entirely exempt from noxious influences arising from their work. Though in much smaller quantity than in the card-rooms,

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cotton fibre is diffused through the air of all the working rooms of cotton factories, as may be seen by its settling on the machinery; and these rooms, as has been stated, are also very frequently close and oppressive, on account of defective ventilation. Weavers appear to be the most exempt from these causes of disease; an exemption which depends partly upon the circumstance that the looms in cotton mills are in general placed in large lofty sheds instead of in ordinary factory rooms. Even in these, however, a small but varying quantity of flue and of dust arising from the flour used to size the yarn is diffused through the atmosphere. The amount of dust depends partly upon the quality of the work; coarse yarn being more highly sized than the finer sort. Here also, as in other instances, the size and especially the height of the rooms modifies the proportion of dust diffused in the air. While in lofty weaving sheds the presence of dust is only discovered from its lodging on the looms, it is plainly perceivable in the form of a slight haze in the atmosphere of weaving rooms which are less lofty and of smaller dimensions. There is nothing to add respecting the men employed in the sizing or dressing rooms for yarn to what was reported on the subject in the paper on Preston, published last year.\* Cotton shoddy-mills, of which there are several in Blackburn, afford employment to a comparatively small number of operatives. Cotton waste is worked up anew in these mills, and much more dust and flue are diffused through the atmosphere than in ordinary cotton factories. The operatives in the "breaking room," where the waste cotton is torn into a woolly state previous to being re-spun, generally cover the mouth with a handkerchief to prevent them from inhaling the dust and flue given off in large quantities during the process.

The cotton operatives of Blackburn are by no means a robust looking race, the men especially being very often pallid, sallow, and stunted. But a great difference may be observed in this respect in the operatives employed in different mills; those who work in country factories being of a more florid complexion, and looking healthier than those who work in the town factories.

According to the census of 1851 a very small number of the inhabitants of Blackburn were engaged in calico printing. A large print-work in the neighbouring parish of Accrington was visited for the purpose of ascertaining the conditions to which the print operatives are exposed. The boys employed in these works were found to be much stunted in growth. Some of the rooms used for block printing were very hot and deficiently ventilated, but lofty, in order to afford space for hanging up the calico. There is no dust in the atmosphere of these rooms. The engravers both on copper and steel declared their occupation to be an unhealthy one; in some degree, perhaps, in consequence of inhaling the fine particles of metal cut off the surface of the plate by the style, but much more so, as they alleged, from the stooping constrained posture which they are obliged to assume while at work. Indeed the older men uniformly declared it to be a tradition of the trade that their stooping attitude very frequently induces pulmonary disease.

Nottingham.  
Radford.  
Basford.

NOTTINGHAM, RADFORD, AND BASFORD.—*Lace-making and Hosiery Manufactures.*

Lace making,  
hosiery.

Nottingham, Radford, and Basford are contiguous registration districts, the former being entirely surrounded by the two latter. The town of Nottingham comprises the registration district of Nottingham and also a portion of that of Radford. The industrial occupations of the

\* Loc. citat, p. 176.



people are similar in the three districts, and consist of the manufacture of hosiery and lace, but the proportion of persons engaged in these employments differs in each district. In Nottingham, according to the census of 1851, 25·7 per cent. of the men above the age of 20 years were engaged in the manufacture of lace and hosiery, of whom 16·4 per cent. were employed in the hosiery, and 9·3 in the lace manufacture. In Radford 41·8 per cent. of the men above 20 years of age were, at the same date, employed in these manufactures, viz., 24·5 in that of lace, and 17·3 per cent. in that of hosiery. In Basford 30·2 per cent. of the men above 20 years of age were employed in these manufactures; that is to say, 24·6 in the manufacture of hosiery, and 5·6 per cent. in that of lace; there were also 10·8 per cent. of the men employed in coal mining. A considerable proportion of the women above 20 years of age were likewise employed in the staple occupations of these districts at the same date, viz., 17·8 per cent. in lace, and 8·6 per cent. in hosiery, in Nottingham; 18·6 per cent. in lace, and 6·6 per cent. in hosiery, in Radford; and 3·8 per cent. in lace, and 16·9 per cent. in hosiery, in Basford. Many women and girls are likewise employed in the warehouses of Nottingham, and a small proportion in the manufacture of silk and cotton in each of the three districts. Many young people of both sexes also find employment in the hosiery and lace manufactures. Nottingham may be regarded as altogether an urban district, only 3·3 per cent. of the men having been engaged in the cultivation of the soil in 1851. Radford is partly urban, partly suburban, little more than one man in twenty having, at the same date, been employed in tilling the earth; Basford is a mixed rural and manufacturing district, one fifth of the men having been engaged in agricultural labour in 1851.

The annexed table shows the number of deaths from diseases of the respiratory organs, exclusive of phthisis, in children under five years of age, and from phthisis and other diseases of the respiratory organs in males and females, respectively, between the ages of 15 and 55 years, in each of the 10 years 1851–60. Until the publication of the details of the last census, it would be impossible to calculate, with any approach to accuracy, the proportion which these numbers bear to the living

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Nottingham.  
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## NOTTINGHAM.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	129	72	75	18	21
1852	90	69	69	12	21
1853	129	74	96	18	25
1854	139	84	95	12	26
1855	91	82	69	19	24
1856	142	67	103	21	23
1857	120	78	104	26	30
1858	142	72	105	29	47
1859	176	85	111	36	26
1860	116	73	116	27	22
Totals -	1,274	756	943	218	265

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RADFORD.

IV. Local inquiries into excessive mortality from lung-diseases.

Nottingham.  
Radford.  
Basford.

Lace making,  
hosiery.

Years.	Diseases of the Respiratory Organs (excluding Phthisis) in Children under 5 years of age.	At ages between 15 and 55 years.			
		Phthisis.		Other Diseases of the Respiratory Organs.	
		Male.	Female.	Male.	Female.
1851	46	16	45	6	4
1852	54	29	38	4	5
1853	64	27	43	4	6
1854	73	19	50	2	14
1855	43	32	22	11	9
1856	63	23	39	5	12
1857	35	34	53	9	13
1858	68	31	48	6	4
1859	59	33	55	6	3
1860	69	33	45	13	14
Totals -	574	277	438	66	84

BASFORD.

1851	88	76	80	11	10
1852	89	62	83	7	11
1853	137	64	124	12	8
1854	101	49	96	11	12
1855	144	42	94	14	11
1856	144	58	105	6	11
1857	141	77	106	10	10
1858	135	55	83	12	27
1859	197	62	104	16	12
1860	116	56	82	9	15
Totals -	1,292	601	957	108	127

population of the same ages ; but the mortality from pulmonary affections of all kinds, including phthisis, during the seven years 1848-54, was at the average annual rate of 8·13 per 1,000 males, and of 7·03 per 1,000 females, of all ages, in Nottingham ; of 6·64 per 1,000 males, and of 6·72 per 1,000 females, in Radford ; and of 5·18 per 1,000 males, and 5·77 per 1,000 females, in Basford.\*

The situation of Nottingham is naturally good, and the sub-soil dry ; but the ground in the older part of the town is densely covered with buildings, and the interspaces between the streets are occupied by narrow alleys and imperfectly ventilated courts. The municipal authorities are gradually effecting improvements, such as opening out thoroughfares and widening narrow streets, which will tend materially to improve the ventilation of the town, and must eventually have a beneficial effect on the public health. There are many back to back and ill-ventilated houses in the older streets, and many of the houses occupied by the poorer classes are said to be over-crowded, but the newer parts of the town, having been erected under the superintendence of the authorities, are unexceptionable both as regards the size and ventilation of dwellings. The town of Nottingham now comprises a considerable portion of Radford. The ground is here less densely

\* See " Papers relating to the Sanitary State of the People of England," p. 80.



covered with buildings, the streets are broader, and the population contains a smaller proportion of the poorest classes than that of Nottingham. Basford contains the little straggling semi-rural town of Old Basford, distant about three miles from Nottingham; New Basford, a modern hamlet, closely adjoining Nottingham, and numerous rural villages and hamlets. There was formerly much domestic manufacture in Nottingham, but the machines now employed in the manufacture both of hosiery and lace being only advantageously worked by the aid of steam-power, the domestic manufacture has been largely superseded by factory labour. Whatever may be the evils of factories this change has been beneficial in regulating the hours of labour. Formerly the stocking makers were idle during the early part of the week, and made up for this loss of time by working very hard at the latter part, sometimes during the whole of Friday night; but now they for the most part work in factories, this irregular kind of labour is no longer possible; neither can they now indulge in the drinking bouts to which they were formerly addicted.

The medical men of Nottingham have long observed the great prevalence of pulmonary diseases among the inhabitants, though they differ in opinion respecting its relation to the industrial employments of the people. Dr. Ransom, Physician to the General Hospital, had noticed the unusual frequency of these diseases, but was unable to state that any particular class of operatives suffer from them in an undue proportion as compared with others. Dr. Massey was only able to indicate the operatives employed in the carding rooms of a merino factory as being liable to suffer from pulmonary disease in consequence of their occupation. Dr. Bramwell, on the other hand, had long observed that the warehouse women, and the operatives who work in close factory rooms and in lace-dressing rooms, are very subject to phthisis. Dr. Wilson also thought the women employed in the lace-dressing rooms to be very subject to phthisis, and added that, in his opinion, other classes of operatives were liable to suffer from pulmonary diseases in consequence of working in ill-ventilated work places and residing in badly ventilated dwellings. Mr. Maltby, Certifying Surgeon to Factories, and also one of the parochial surgeons for Basford, on the contrary, stated he had not observed that any particular class of operatives suffer more than others from pulmonary diseases. No trustworthy statistics could be procured which would serve to show that any particular class of the operatives of Nottingham (including both Radford and Basford under that term) suffer from diseases of the chest by reason of their occupation. The register books of the Dispensary were carefully examined by Mr. E. B. Truman, resident surgeon to the institution, for the purpose of tabulating the occupations of the patients who had presented themselves on account of pulmonary disease, but the facts he obtained were not of such a nature as would justify the deduction of any definite conclusions on this subject.

Besides the factories for making lace and hosiery, there are several collateral branches of industry connected with the staple trades of the district, such as the warehouses, the lace-dressing rooms, also one or two cotton-spinning and doubling and silk-throwing mills, some bleach works, and the domestic workshops, in which a considerable number of stocking-makers continue to work with the old hand-frame. The operatives employed in some of these are liable to inhale dust or flue; in others they are exposed to the noxious influences attendant on working in badly ventilated or over-heated rooms.

*Manufacture of Hosiery.*—A little flue is given off in the manufacture of hosiery, but the quantity is inconsiderable. The machine rooms in the hosiery factories are, for the most part, lofty and

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ample as regards space, but the ventilation is very frequently defective, and the atmosphere is of course, in such instances, hot and close. These, like most factory rooms, are warmed by means of iron pipes heated with steam, and are ventilated by means of casements in the windows or by grated openings in the walls; but these ventilating apertures are frequently kept closed. The difference in the sensation experienced on entering one of these rooms under such circumstances, after coming from a better ventilated one, perhaps in the same factory, was very striking, even though the temperature might be the same in both. A similar contrast was likewise noticeable in the different aspect of the operatives in such cases; in the one room they would look pallid and sickly, in the other healthy. There are in Nottingham and the neighbourhood several factories for spinning the yarn employed in making the kind of hosiery called merino. The materials, consisting partly of cotton, partly of wool, are passed through "wilying" and carding machines, as in the woollen and cotton manufactories, and both dust and flue are given off into the atmosphere of the rooms in proportion to the completeness or incompleteness with which the machines are covered. These, of course, produce similar effects on the operatives to those experienced by the card-room operatives in cotton factories. Hosiery is sometimes made to undergo a process for raising the nap, so as to give it a fleecy surface. This is accomplished by passing the articles between rollers, provided with wire brushes or teasels, and much flue is diffused through the atmosphere of the brushing rooms during the process. This department of the manufacture is injurious to health, and the operatives employed in it are of a sickly aspect; but their number is small, and a large proportion of them are young persons, who cease in the course of a few years to follow the occupation. The latter circumstance renders it difficult to trace the result of the noxious influences under which they have worked, seeing that bronchial irritation resulting from the nature of their previous employment may endure long after they have discontinued it, and even lay the foundation for life-long illness. But it was agreed on all hands, as well by employers as by the overlookers and others connected with the work, that the occupation is a very unhealthy one, and that the persons employed in it are very liable to suffer from pulmonary disease. The brushing of hosiery, as this process is called, is chiefly done at bleach-works, where it is finished and got up for the market, and rarely at the manufactory.

Several other processes connected with the finishing of hosiery require brief notice, not on account of anything directly injurious to health in the processes themselves, but because of their frequent coincidence with an unhealthy state of the workrooms arising from defective ventilation. This applies especially to the rooms in which women and girls are engaged, either at the stitching machines, or in cutting out, making up, or otherwise finishing the articles. The winding-shed of one factory was small and overcrowded; but, with the exception of this, and of that of a mending room at a bleach-work, which afforded only 200 cubical feet of breathing space for each inmate, it cannot be said that these rooms are much overcrowded in Nottingham, provided there were sufficient means for renewing the air. In three factories these rooms, each with an average of 240 cubical feet of space per head, were found to be close and unhealthy, in consequence of the ventilating apertures being shut. One of these rooms, in which sixty persons were at work, had the top row of panes in each window filled with fine wire gauze instead of glass, but these panes were all closely papered over so as to prevent the



entrance of fresh air through the interstices of the wire. The others, in which fifty and thirty operatives respectively were found at work, were provided with casements in each window, which were also closely fastened up. In another room, containing sixty operatives, and affording an average of 280 cubical feet of breathing space for each person, the windows were likewise all closed. In a third room, with 120, and a fourth with 70 operatives, each affording an average of at least 350 cubical feet per head, the grates and other apertures provided for ventilation were also carefully fastened up, so as to prevent the admission of fresh air. The best illustration of the effect of closing up the openings provided for ventilation was afforded by a factory in which two winding rooms, each of the same size, and having nearly the same number of inmates, presented a remarkable contrast. In one the ventilating casements were wide open, and the air was pure and agreeable; in the other they were all closed, and the air of the room was not only close, but actually stank of the exhalations given out from the lungs and skin of so many persons. Some of these rooms also afforded proof that, though operatives are, as a class, very impatient of draughts of air, they do not always object to proper ventilation, provided this be effected without subjecting them to personal inconvenience. In one steam-stitching machine room, where 90 women and girls were employed, nearly all the casements were open, and the atmosphere of the room was pleasant. The room was certainly spacious and lofty, affording an average of 540 cubical feet of breathing space to each inmate; but the circumstance, nevertheless, shows what may be done in the way of ventilation if it be carried out judiciously. The ventilating casements were here seven feet from the floor, and they opened inwards in such a manner as to direct a current of air towards the ceiling, an arrangement which almost effectually prevented draughts. It was stated by several leading manufacturers and other persons connected with the making of hosiery, that the operatives are an unhealthy set of persons, and especially that they are extremely liable to catarrh.

*Lace Manufacture.*—There is nothing necessarily injurious to health, either in the manufacture of lace or in those of cotton-doubling or silk-throwing, as these operations are carried on at Nottingham. Excepting in the rooms where cotton-yarn is “gassed,” that is, passed rapidly through the flame of a gas-burner to singe off the projecting filaments, no appreciable amount of dust or flue is disengaged in any of these processes. A considerable quantity of singed flue is scattered about the gassing-rooms, but these rooms are so hot from the number of gas-burners, that they are always freely ventilated; and it was not found, on inquiry, that the persons who work in them suffer more than other operatives from pulmonary disease. There is ample space in the machine rooms of the lace factories, and also of the cotton and silk mills of Nottingham; but their ventilation is frequently, perhaps generally, defective. This arises from the cause that has so frequently been adverted to in these reports; viz., either that the means of ventilation provided are of such a nature that when in operation the workpeople are exposed to inconvenient or dangerous draughts of air; or that, in ignorance of the necessity for a constant change of atmosphere, the operatives close up every opening by means of which fresh air could be admitted. Indeed, the manufacturers themselves are not fully alive to the necessity for ventilation, the management of which they generally therefore leave to the discretion of the operatives; and, as a rule, the architects of factories, with few exceptions, appear to be entirely unacquainted with the subject. The evils incident to defective ventilation are much increased in winter by the prevalent mode of warming the work-rooms by means of pipes

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heated by steam, and by the consumption of gas for lighting them during at least several hours daily. Many of these rooms are hot and oppressive in the day-time, but the evil is greatly aggravated in the evening after the gas has been some time lit. The temperature early in the day was as high as  $80^{\circ}$  in one silk-throwing room where 130 operatives were at work, when the external temperature did not exceed  $60^{\circ}$ . The room was sufficiently large for the number of persons at work, but not a single opening for the entrance or exit of air was in use, and, but for the occasional opening of a door, the people were practically working in an almost hermetically closed apartment. This was by no means an extreme case, several others equally objectionable having fallen under notice. It is but just to add that some of a better kind were also seen. One of the latter, in all respects admirably adapted to preserve the health of the operatives, deserves notice. It is built in the form of a large shed, and so lofty that each operative, of whom there were in all about 350, had an ample allowance of breathing space. At a little before six o'clock p.m., when nearly 300 gas-burners had been for some time lit, the atmosphere of the room was pleasant, and had a freshness very unusual in factories. This room was ventilated by means of sky-lights, and of openings in the walls made at a considerable height above the ground.

Although the machine-rooms of these factories are of such ample dimensions in proportion to the number of their inmates, some of the other rooms have the evils of over-crowding added to those of insufficient ventilation. Thus, in a "clipping" and "scolloping" room at a lace factory where, when in full employment, 150 persons, chiefly children, work, the average amount of cubical space per head amounted to only 182 cubical feet. The ventilating casements were all closely shut, and, although rather under 100 young people were at work on the day of visit, the room was close and hot. A "lace-mending" room in the same factory, which afforded accommodation to 40 persons, gave on an average 220 cubical feet of breathing space to each inmate. A similar room in another factory, where the casements were all likewise closely shut, gave on the average only 170 cubical feet of breathing space to each of 37 women and girls found at work in it when visited. Other rooms of a like kind afforded 208, 244, and in one instance as high as 440 cubical feet per head, the number of inmates in each room varying from 44 to 80.

Lace-dressing rooms, in which lace and net undergo a process of starching, are of large dimensions. An averaged sized one measured 240 feet in length by 70 in breadth and 10 in height. The lace is here stretched on frames capable of being expanded or contracted at pleasure, so as to maintain the lace constantly in a state of moderate tension during the process. This consists in daubing the lace with some kind of starch, which is then diffused evenly over it by means of light rollers, any filmy accumulation in the interstices being removed by a slight blow with an elastic cane. The rapid completion of the process being a great object in these establishments, the rooms are heated to a temperature varying from  $84^{\circ}$  to  $90^{\circ}$  and upwards, in order to hasten the drying of the lace, and the windows are kept freely open in fine weather. Very few operatives work in these rooms, and they appear for the most part stout and healthy; but, as has already been said, some of the medical men consider them as very liable to phthisis; an opinion, however, not supported by the evidence gathered from the overlookers and other persons employed in these establishments. Women and girls only are employed in these rooms, and the latter are said to undergo very rapid development into womanhood; but, little



skill being required in this occupation, these women form the lowest class of the female operatives of Nottingham. APPENDIX.

*Warehouses.*—There are in Nottingham many large warehouses for the sale of the staple manufactured goods of the district, affording employment to a large number of persons, chiefly women and girls. These constitute the highest class of operatives in the neighbourhood; and, excepting that many of them must lead a sedentary life, there is no reason, so far as their occupation is concerned, why they should be unhealthy. That they are so is, however, generally admitted; and though an exception must be made in favour of several warehouses, these females often contrast most unfavourably in appearance with the operatives who work in factories. The sale-rooms in the warehouses are always large in proportion to the number of inmates, and mostly consist of two or three floors, with a large well or open space in the centre, which makes them, practically speaking, one room, having one or two successive tiers of galleries; but there are almost always other rooms for mending and finishing the goods, which, though also for the most part of sufficient size, are much less airy than the sale-rooms. These warehouses are warmed and ventilated in various modes. Sometimes they are warmed by means of pipes heated by steam, and ventilated by means of a dome or skylight, or by grated openings in the walls or casements; but the two latter were very frequently disused, the casements being often so low as to prevent them from being opened without inconvenience to the work-people, and the grates frequently papered over or choked up by the operatives so effectually as to prevent their serving for the transmission of air. In other cases, the warehouses are heated by means of flues, when the warm air is generally too dry, and irritates the mucous membrane of the lungs.

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hosiery.

In one warehouse visited, cold fresh air is drawn into flues, which encircle a furnace, and the heated air conveyed by flues to each room, the quantity admitted being regulated by means of dampers or valves. There are also grated openings in each room for carrying away the foul air. To obviate the excessive dryness of the hot air, there is, in each of the two flues surrounding the furnace, a moveable trough capable of holding two gallons of water; but these, being only filled once a week, were found quite dry on the third morning afterwards, and are quite inadequate to supply the amount of moisture necessary for rendering the heated air suitable for respiration. A somewhat similar mode of heating was employed in another warehouse, one of the largest and handsomest in Nottingham. Here the heated air enters the rooms through openings near the ceiling, while there are similar openings for carrying off the foul air near the floor. There are likewise casements in each window at the height of six feet from the ground, none of which were in use on the day of visit. The artificially heated air in this establishment proved so irritating to the lungs, that the overlooker of one large room had carefully closed up all the openings, assigning as a reason for so doing that the heated air caused dryness of the throat, and that colds were more prevalent among his people when they inhaled the heated air. This statement was confirmed by other persons employed in the room, or who had been exposed to the influence of its atmosphere. Facts illustrative of the state of health of the warehouse hands could not be generally obtained; but there is a sick club connected with a particular warehouse, the proprietors of which have spared no expense, and have made extraordinary though it would appear unsuccessful efforts, to provide for the health and comfort of the people they employ. The club has been established nearly three years. Beginning with 204 members, no less than 130 of



## APPENDIX.

Excessive  
mortality from  
lung-diseases.

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these required medical aid in the course of the first year, and 173 in the second.

Much work of a certain kind is still done at the dwellings of the operatives in and around Nottingham, especially the finishing and scolloping of lace, and the finishing and also the knitting of hosiery upon hand frames. The women and girls employed in the former rarely, it is said, work more than 10 or 11 hours per day ; but during this time they are engaged in a very sedentary occupation, and, though less so than formerly, the rooms in which they work are often ill-ventilated and over-crowded. One room, in which 12 young girls were found at work, afforded an average of only 112 cubical feet of breathing space for each ; a second, in which were 8 girls, and a third with 10, afforded each 140 cubical feet per head ; a fourth, with 8, had 175 ; and a fifth, with 7 girls 192 cubical feet of breathing space for each inmate. These were said to be fair samples of the sort of rooms in private houses in which young women and girls are still sometimes employed ; but this practice is rapidly being discontinued, the work being now chiefly done either at the factories or the warehouses. The manufacture of hosiery by hand frames in domestic workshops is also gradually being superseded by factory labour in Nottingham and its immediate neighbourhood ; and the shops are now less crowded than formerly. These workshops are generally at the tops of the houses, and must formerly have been much over-crowded, and still are very often badly ventilated. The smallest of these garret workshops, in proportion to the number of persons at work in it, seen during the inquiry, afforded 176 cubical feet of breathing space to each inmate ; others gave an average of 250, 278, and 370 cubical feet to each person, but the latter had formerly accommodated more operatives than they do at present.

## SUMMARY OF THE INQUIRY.

General  
summary of  
remarks.

The results obtained by the present inquiry are almost identical with those arrived at in the similar inquiry made in the autumn of 1860, and they may be conveniently arranged under the two former heads of the summary appended to the report of that inquiry, viz.:—

A. Conditions which directly excite pulmonary disease.

B. Conditions which may be at least regarded as indirect causes of these diseases.

A. 1.—The conditions which have been found directly to excite pulmonary disease are inhaling an atmosphere impregnated with dust, consisting of fine particles of metal or of sand-stone, of the materials used in making moulds for casting metals, of the powder of mother-of-pearl shell, or of oxyde of zinc, of coal or stone dust, of soot, and of dust, and flue from wool or cotton. These are exemplified in the cases of the edge tool, sword, and gun-barrel grinders of Birmingham ; in the brass and iron founders of Birmingham and Wolverhampton ; in the turners and enamellers of hollow hard-ware ; in the button makers of Birmingham ; in the coal and ironstone miners of Wolverhampton, Merthyr Tydfil, and Abergavenny ; and in the card room and other cotton operatives of Birmingham, and the hosiery operatives of Nottingham.

2. Inhaling an atmosphere containing carbonic acid or other gases unfit for respiration, or the fumes arising from the combustion of gun-powder or metal, as in the cases of the miners of Wolverhampton, Merthyr Tydfil, and Abergavenny, and the brass-casters of Birmingham.



B. 1.—Working in ill-ventilated or over-heated factory rooms or workshops, as in those of some of the silk mills of Coventry ; in the domestic weaving shops, and in the watchmakers factories and workshops of the same city ; in the button makers and various other workshops of Birmingham ; in the factory rooms of Blackburn and Nottingham ; and in many of the domestic shops and warehouses of the last-named district.

2. Exposure to vicissitudes of temperature, as in the cases of the miners of Merthyr Tydfil and the factory operatives of Blackburn.

3. Working continuously, during many hours daily, at a sedentary occupation, as exemplified in the cases of the women and girls employed in the lace and hosiery finishing and winding rooms of Nottingham.

4. Maintaining a stooping or otherwise constraining posture while at work, as exemplified in the watchmakers of Coventry.

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V. DR. GREENHOW'S REPORT on the Circumstances under which there is an excessive Mortality of Young Children among certain manufacturing populations.

V. Local inquiries into excessive mortality of young children.

My instructions were, to "inquire into the sanitary circumstances of the infantine population of Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny,—with regard, namely, to conditions of dwelling, nourishment, and tendance ; and into the influence exerted upon infantile mortality by the poverty of parents, by illegitimacy of birth, and by the industrial occupation of mothers." It is obvious that unwholesomeness of dwelling, unsuitable diet, and neglect of proper tendance, must, when they exist either separately or collectively, exercise a most powerful influence upon the health and mortality of young children ; and that, wherever these prevail, the infantile mortality must necessarily be large ; but it was found most difficult to obtain precise information on the subject. It may indeed be assumed that unwholesome conditions of dwelling will prove more injurious to young children, whose tender and delicate frames are ill adapted to resist such hurtful influences, and who, being more within doors, are more constantly exposed to them, than to older children and adults. And in fact it was found, in the course of an inquiry into the causes of diarrhœa, made in 1859,\* that while this disease was more prevalent and certainly much more fatal where the air or the water was tainted with certain products of decomposition, yet that more than two-thirds of all the deaths from that disease, during the previous five years, in the several districts comprised in the inquiry, were those of children under five years, and more than half those of children under one year of age. In like manner it may be assumed, that wherever young children are improperly or insufficiently fed, whether this arises from poverty or ignorance, the infantile mortality will be large. And so, likewise, a prevalent absence of that careful tendance so essential to the successful rearing of children, whether it proceed from the poverty of parents, or from the mothers' time and attention being engrossed by their employment in some kind of in-

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Blackburn,  
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\* Second Report of the Medical Officer of the Privy Council, pp. 157-60.

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dustury, or from the neglect of their offspring, so common in the mothers of illegitimate children, will certainly be accompanied by a corresponding high rate of infantile mortality.

The truth of these general propositions is undeniable, but the precise measure of the influence of each of them upon infantile mortality, in the several districts under consideration, could not be determined. The precise effect of illegitimacy of birth upon health and mortality, for example, could only be satisfactorily established by the aid of returns showing the total numbers of the births and deaths, both of legitimate and illegitimate children, during a stated period, and by comparing the rate of mortality in the two classes within a certain time after birth. But, although it is probable that the influence of illegitimacy of birth is great upon individual health, its effects upon the gross mortality of young children, in an entire district, can be only small. Of the several districts comprised in the present inquiry, Nottingham, where the illegitimate births during the last ten years have constituted one-tenth of all the births, is that in which there is the greatest proportion of illegitimate births; in Coventry one-fourteenth of the births during the last ten years were those of illegitimate children; in Wolverhampton rather more than one-eighteenth; and in Birmingham one-twentieth belong to this class. The annexed table shows the total number of births, the number of illegitimate births, and the proportion of the latter to the former, in each of the districts included in the present inquiry during the ten years, 1850-59:—

**NUMBER and PROPORTION of Births and of Illegitimate Births during the Ten Years 1850-59, in each of the subjoined Districts.**

Name of District.	Total Number of Births.	Number of Illegitimate Births.	Proportion of Illegitimate Births in each 100 Births.
Nottingham - - -	22,612	2,272	10·04
Basford - - -	26,413	2,396	9·07
Radford - - -	10,936	873	7·98
Coventry - - -	15,225	1,073	7·04
Blackburn - - -	41,387	2,539	6·13
Wolverhampton - - -	49,061	2,776	5·65
Birmingham - - -	76,893	3,887	5·05
Abergavenny - - -	24,353	1,168	4·79
Merthyr Tydfil - - -	38,393	1,709	4·45
Aston - - -	31,621	1,242	3·92

However large may be the mortality of illegitimate children in any of these districts, it could not suffice materially to influence the amount of the infantile death-rate. It is indeed an unquestionable fact, that the rate of illegitimacy of birth is sometimes very large where the death-rate of young children is high; but there is at present no satisfactory proof that these stand to each other in the relation of cause and effect; and the more probable supposition is, that where vice is rampant, there likewise other unwholesome conditions are in excess. The subjoined table shows the number of deaths in the several districts included in the inquiry during the last ten years, from all causes, among persons of all ages, and in children under one year of age; and from all causes, from diarrhoeal diseases, the diseases of the respiratory organs (exclusive of phthisis), from nervous diseases, and from smallpox, scarlatina, measles, and whooping cough in children under five years of age:—



NUMBER of DEATHS, from Specified Causes, at Specified Ages, during the decennial period 1851-60, in the several subjoined Registration Districts.

Name of District.	At all Ages.	At less than One Year of Age.	At less than Five Years of Age.							
	All Causes.	All Causes.	All Causes.	Diarrhoeal Diseases.	Diseases(excluding Phthisis) of the Respiratory Organs.	Nervous Diseases.	Smallpox.	Scarlatina.	Measles.	Whooping Cough.
Birmingham -	51,238	14,121	25,580	3,509	4,600	2,438	495	1,412	1,216	1,491
Aston -	17,585	5,175	8,927	1,178	1,676	840	168	546	337	447
Wolverhampton -	31,899	9,976	17,975	1,728	3,594	2,628	318	892	1,240	629
Merthyr Tydfil -	26,311	7,079	13,583	813	1,641	3,918	778	708	546	380
Abergavenny -	15,909	3,926	7,445	316	1,313	1,650	201	514	324	252
Coventry -	9,914	3,281	5,134	999	796	465	79	218	247	187
Blackburn -	27,750	8,178	14,062	1,008	2,227	2,222	154	926	707	575
Nottingham -	17,890	5,035	8,226	1,015	1,274	1,565	118	414	459	421
Radford -	7,241	2,152	3,558	429	574	648	32	227	199	182
Basford -	15,848	4,880	7,415	446	1,292	1,508	202	366	309	261

Until the publication of the details of the last census, the proportion which the deaths of children under five years of age bear to the living population of the same period of life cannot be ascertained ; but the subjoined table shows the annual average rate of mortality per 1000 persons, from all causes, among persons of all ages, and among infants under one year of age, during the ten years 1851-60 :—

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AVERAGE Annual Proportion of Deaths in each 1,000 Persons living at the undermentioned Ages, in each of the several under-mentioned Districts, during the decennial period 1851-60.

Name of District.	Persons of all Ages.	Infants at less than One Year of Age.
Birmingham -	26·51	183·6
Aston -	21·01	163·6
Wolverhampton -	27·61	203·3
Merthyr Tydfil -	28·62	184·4
Abergavenny -	25·18	161·2
Coventry -	25·27	215·5
Blackburn -	26·34	197·1
Nottingham -	26·66	222·6
Radford -	25·29	196·8
Basford -	22·95	184·7

Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny.

The total population of each district, according to the census of 1861, having been already published, the average annual proportion of deaths in the entire population, without distinction of age or sex, during the ten years 1851-60, was readily calculated, and may be re-

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garded as being as near an approximation to the truth as possible. The rate of mortality among infants under one year of age has been calculated on the supposition that the mean annual number of births during the ten years 1850-59 would nearly represent the mean population of children under one year of age during the ten years 1851-60. It is true, that this calculation can only approximate to correctness,\* but all similar calculations can likewise be only regarded as approximations to the truth, and this, at least, coming as nearly as possible to accuracy, the rates shown in the table may be deemed fairly to represent the comparative rate of mortality among young infants in the several districts. On comparing the infantile and general death-rates in the several districts with one another, it is evident that they bear no constant relation to each other, and that the infantile death-rate is not always greatest where the general mortality is highest. Thus, if the rates of mortality in each district, among persons of all ages, be counted as 100, the infantile death-rate would be 853 in Coventry, 835 in Nottingham, 804 in Basford, 778 in Radford, 774 in Aston, 748 in Blackburn, 736 in Wolverhampton, 692 in Birmingham, 646 in Merthyr Tydfil, and 640 in Abergavenny.

Of the several districts, Coventry and Nottingham show the highest rates of infantile mortality, both absolutely, and relatively to their general mortality, but the general death-rates, that is to say, the rate of mortality among the inhabitants, without limitation of age, of these districts, are lower than those of some other districts, included in the present inquiry. On the other hand, Merthyr Tydfil, which shows the highest general death-rate, has both a lower rate of infantile mortality than either Coventry or Nottingham, and this of course bears a smaller proportion to the general rate. That there is often an intimate relation between a high general death-rate and a large infantile mortality is indeed undeniable; but it is evident, from the facts just stated, that this relation is not constant, and that while, doubtless, many causes of ill-health and mortality are common both to the infantile and the older population, there must likewise sometimes exist influences especially injurious and fatal to young children. On the other hand, it should be observed that where any causes of ill-health operate specially upon adults there the infantile mortality will necessarily bear a smaller proportion to the general death-rate. Most certainly, however, this does not apply to the districts at present under consideration; and it would appear, from the large proportion which the infantile bears to the general death-rate in these districts, that in Coventry, Nottingham, Blackburn, Birmingham, and Wolverhampton infants are subject to some other causes of ill-health and mortality besides those to which the general population are exposed. These causes were made a particular subject of inquiry in each of these districts, and were found to consist mainly of improper feeding and defective tendance arising from the large employment of mothers in factory and other labour.

A large number of married women work in the factories and warehouses of Nottingham, Coventry, Blackburn, Birmingham, and Wolverhampton, but no certain means exist for determining the proportion which they bear to the adult female population of those towns. As regards Birmingham, indeed, it may be inferred from some statistics collected by the Birmingham Educational Association, that the proportion is very large; but an accurate estimate cannot be made. In the

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\* Some of the births, especially of illegitimate children, escape registration in populous town districts.



course of an inquiry into the causes which retard the progress of education among the families of the working classes in that town, the Association endeavoured to collect with accuracy in every part of the town small but definite numbers of facts, arranged under certain heads of inquiry. The plan adopted was that each clergyman should select for investigation groups of twenty-five contiguous houses in different parts of his parish, and furnish returns respecting their inhabitants under each head of the inquiry. Returns relating to 1,043 families were received by the association from 16 parishes or ecclesiastical districts. In 415 of these the condition of the mother as regards employment was recorded. An analysis of the returns showed that out of these 415 married women only 32 per cent. attended exclusively to domestic duties, whilst 68 per cent. were engaged in some special occupation, including those of laundress, shopkeeper, needlewoman, and charwoman, besides various kinds of manufacture under that term. In addition to those women who work away from home, a considerable number are employed in different industrial occupations of a domestic character, such as boot-binding, brace stitching, chain, toy, and umbrella making, french-polishing, &c. The proportion of married women engaged in industrial employments, either at home or in factories, is probably larger in Nottingham, Coventry, and Blackburn than even in Birmingham. The manager of a large factory in Coventry, who has devoted much attention to the subject of female employment, in reference to its effects on children, said he reckoned that two females are employed in that town for every male, and that probably one-third of the females are married women. Garret and other domestic labour is on the decrease, and factory work on the increase, in Birmingham, Nottingham, and probably in the other manufacturing towns included in the present inquiry, and with it the proportion of married women who work in factories away from home is also undoubtedly increasing.

Married women who work at any particular kind of industry have usually begun to do so in girlhood; sometimes as early as seven or eight; usually at nine or ten years of age. Young girls who work during the greater part of the day in factories rarely acquire the knowledge of household economy necessary in order to their becoming good housewives, and, above all, they grow up in total ignorance of the management of young children, and therefore become incompetent mothers. Factory women soon return to labour after their confinement. The longest time mentioned as the average period of their absence from work in consequence of child-bearing, was five or six weeks; many women among the highest class of operatives in Birmingham acknowledged to having generally returned to work at the expiration of a month; and it was stated by several medical men of great experience, and by other witnesses in Coventry and Blackburn, that the factory women even sometimes return to work as early as eight or ten days or a fortnight after their confinement. The mother's health suffers in consequence of this early return to labour, especially if, as is often the case, it is carried on in a standing position; and the influence on the health and mortality of children is most baneful.

Infants thus deprived of maternal care during the greater part of the day, are left to the management of children or hireling nurses, and are fed during their mothers' absence on artificial diet in lieu of their mothers' milk. All the medical men who gave evidence on the subject of the present inquiry, besides several clergymen, ladies who are accustomed to visit the poorer classes at their dwellings, scripture readers, relieving officers, and other persons who have paid attention to the subject, unhesitatingly expressed an opinion that the system under which

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the mothers of young children are employed at factories and workshops away from home is a fruitful cause of infantile sickness and mortality. Mothers employed in factories are, save during the dinner-hour, absent from home all day long, and the care of their infants during their absence is entrusted either to young children, to hired nurse-girls, sometimes not more than eight or ten years of age, or perhaps more commonly to elderly women, who eke out a livelihood by taking infants to nurse. Young girls, aged seven or eight years, are frequently removed from school for the purpose of taking charge of younger children while the mother is absent at work, and are sometimes said to return, on the death of the child, evidently rather pleased that this event has released them from their toil. Children who are old enough are frequently sent to the infant schools for the purpose of being taken care of. At one set of schools, visited in Birmingham, there were only 68 older children, but more than 200 infants in attendance; and the mistress of another school, where children are not admitted at an earlier age than three years, said that she was often urged to receive younger children, in order to take care of them during their mothers' absence at factories, adding that she might have many elder girls who are kept at home to nurse the infants, provided she would take charge of the latter also. Thus, super-added to the loss of their natural food during the greater part of the day, these poor babes are deprived of the warmth and comfort of their mothers' bosoms, and it may likewise be added of the active exercise in which healthy children delight, and which is so conducive to their health and to the proper development of their muscular system.

The manager of a large factory in Coventry, of many years' experience, said that formerly, when he resided in the town, he saw much of this practice. Women being obliged to attend at the factory at an early hour, are always hurried in the morning, and may be seen on their way to the mills, hastening along the street, with their children only half dressed, carrying the remainder of their clothes, and their food for the day, to be left with the person who has charge of the child during its mother's absence; and this oftentimes on a cold winter's morning in the midst of sleet or snow. Even where women are employed in domestic manufactures they are obliged to neglect their offspring, more or less, and cannot bestow upon them the time and attention given by mothers who are engaged in no special kind of industry. Parents who thus entrust the management of their infants so largely to strangers become more or less careless and indifferent about them, and as many of these children die the mothers become familiarised with the fact, and speak of the deaths of their children with a degree of nonchalance rarely met with among women who devote themselves mainly to the care of their offspring. Without entirely concurring in the opinion expressed by several persons in Nottingham, that child murder is common in that town, it may yet be affirmed without hesitation, from the facts brought to light during this inquiry, that a greater degree of indifference is manifested towards their children by the female operatives of manufacturing towns than is found to be the case elsewhere.\*

The contrast between the treatment of infants by their mothers in Merthyr Tydfil and Abergavenny and in the factory towns was most remarkable. The mortality among young children in these Welsh districts is said by the local medical practitioners to be much augmented

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\* Mr. Brown, the coroner for Nottingham, said, that he believed child-murder to be of much more frequent occurrence than is detected, and added that mothers in that town are very careless about their children, and that the mortality arising



by mismanagement, more especially by exposure to inclement weather and by improper feeding, but these habits proceed from ignorance, and not from neglect, the mothers, for the most part, being devotedly attached to their offspring. The houses are kept very hot within doors by means of large fires, and the mothers are accustomed to carry their children about with them wherever they go. Even children suffering from bronchitis, which is very prevalent in this bleak region, are habitually

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from this cause is very considerable. In illustration of this fact he referred to the large number of inquests which he has held on the bodies of infants found dead, and furnished a return here subjoined, together with the note which accompanied it:—

INQUESTS held in the Town of Nottingham on the Bodies of Infants found in Privies and the Canal, or exposed in the Fields or open places, from January 1856 to October 1861.

Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny.

Date.	Sex.	
1856:		
January 9	Male child	- Found dead in a privy.
„ 17	Female do.	- Do.
February 16	do. do.	- Do. Verdict—Wilful Murder.
March 6	do. do.	- Found near the footway in the meadows. Verdict—Wilful Murder.
Sept. 15 & 19	do. do.	- Found in a field. Verdict—Wilful Murder.
1857:		
March 14	Male do.	- Found in a privy.
„ 18	do. do.	- Found in a chamber utensil.
„ 26	do. do.	- Found in one of the new streets of Nottingham, where it had been placed immediately after birth. Verdict—Wilful Murder.
October 10	do. do.	- Found by the canal side. Verdict—Wilful Murder.
November 4	Female do.	- Found in a privy.
„ 10	Male do.	- Found in the meadows.
1858:		
January 5	Female do.	- This child was found in the general cemetery. A grave had been dug for an interment, and left for a time, and on the sexton returning to it he found the body of this child had been thrown in. Verdict—Wilful Murder.
May 4	Male do.	- Found under a bed. Died from want of attention at the birth.
1859:		
February 28	do. do.	- Found in the canal.
September 9	do. do.	- Do.
1861:		
February 19	do. do.	- Found in the church cemetery. Verdict—Wilful Murder.
June 26	Female do.	- Found in a privy. Verdict—Wilful Murder.
October 8	do. do.	- Found in a privy.

DEAR SIR,

Nottingham, 31 October 1861.

I now send you a return of the inquests held by me since the beginning of the year 1856, on the bodies of children found in privies, in the canal, or exposed in the fields or open places. Any other returns which you may wish for, and I can give, shall be made out for you.

I had last night an illustration of my view as to the state of morals amongst females employed in Nottingham warehouses. I held an inquest on an illegitimate child whose mother was a warehouse girl living away from her parents' house, though not at a great distance from them, in a hired room. A younger sister was living with her, and she (the sister) was also a warehouse girl, and the mother of an illegitimate child only a few weeks old.

Dear Sir, Yours faithfully,

M. BROWNE,

Coroner for Nottingham.

H. Greenhow, Esq., M.D.

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carried from the hot air within the house into the cold external atmosphere, whenever the mother has occasion to go out of doors. Another cause of infantile illness, and especially of convulsions, which occasion a large mortality in some of the Welsh districts, was said to be the custom of covering infants entirely over when laid in a cradle or bed. The air breathed by the infant while asleep is on this account imperfectly changed, and this may perhaps be one cause of the great prevalence of nervous diseases among the children of these districts.

Children left by their mothers during so great a part of the day are fed in their absence on artificial food, which is for the most part unsuited to their digestive powers. The children are thus almost entirely spoon-fed, the mother being able to nurse them only at night, perhaps hastily early in the morning before setting out for the mill, again at dinner-time, and no more until evening. The medical practitioners of some of the factory districts expressed their belief that under these circumstances the milk undergoes a change injurious to the health of the infant, in consequence of its long detention in the mother's breast. Doubtless, in the first weeks after confinement, the breasts become overdistended during the long absence of the mother from her offspring, and this may primarily disorder the mother's health, rendering her feverish, and, secondarily, that of the infant, by altering the character of the milk secreted, but any change in the quality of the milk after secretion would seem to be improbable, seeing that the longest interval in suckling does not exceed six hours. In all probability the woman's organism soon accommodates itself to the habit of nursing at long intervals, the milk being secreted slowly during her absence from home, until the time of nursing her child approaches, when a more abundant secretion will take place.\*

Pap, made of bread and water, and sweetened with sugar or treacle, is the sort of nourishment usually given during their mother's absence, even to infants of a very tender age, and in several instances, little children, not more than 6 or 7 years old, were seen preparing and feeding babies with this food, which in such cases consisted only of lumps of bread floating in sweetened water. Other farinaceous articles, such as arrowroot, oatmeal, and sago, are sometimes used, but less frequently than bread. Milk is also occasionally, but very rarely, employed instead of water, partly, no doubt, on account of expense, but also because of the prevalent belief that cow's milk disagrees with such infants as are partly suckled by their mothers.

Illness is the natural consequence of this unnatural mode of feeding infants. The great prevalence of diarrhoea among children was partly attributed to this cause by the medical practitioners of Coventry and other places included in the inquiry into the causes of diarrhoea made in 1859; and similar opinions were expressed during the present in-

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\* Since writing the above, my colleague, Dr. Priestley, Physician Accoucheur to the Middlesex Hospital, who had formerly good opportunities, when residing at Barnsley, for studying this subject, has favoured me with the following observations:—

“The long intervals which are allowed to elapse between the times of nursing their children have seemed to me to affect the milk of women employed in factories in two ways. In the earlier period after delivery, the long absence of a mother from her child permits the breast to become overdistended, and induces a feverish condition in the mother, which alters the character of the lacteal secretion. I have repeatedly seen a child suffer great pain, and have occasionally witnessed more severe symptoms, follow nursing after the breast had been long distended, and had at length become painful. At a later period the breast accommodates itself to the circumstances of the case, and the secretion of milk becomes less, producing no inconvenience to the mother. I doubt whether the milk then acts injuriously, as in the former case, but it probably becomes more watery and less nutritious. The child then suffers from insufficient nourishment, and the errors of artificial feeding increase the mischief.”



vestigation. Children who are healthy at birth rapidly dwindle under this system of mismanagement, fall into bad health, and become uneasy, restless, and fractious. To remedy the illnesses caused by mismanagement, various domestic medicines are administered, more particularly some kind of opiate, such as Godfrey's cordial, or laudanum. Wine, gin, peppermint, and other stimulants are likewise often given, for the purpose, as alleged, of relieving flatulence, their actual effect being, however, rather to stupify the child. The quantity of opiates sold for the purpose of being administered to infants in some of the manufacturing towns is very large. It would be difficult, perhaps impossible, to ascertain the precise quantity, but certain facts were gathered on this head in the course of the inquiry. Through the aid of Mr. Wyley, Mayor of Coventry, a return of the quantity of Godfrey's cordial sold by them was obtained from twelve retail druggists in that city. From these returns it seems probable that at least ten gallons of this medicine are sold per week in Coventry, which, as a teaspoonful is the usual dose given to an infant six months' old, would amount to at least 12,000 doses. Godfrey's cordial is chiefly administered to infants under two years of age; and as the probable number of these has, on the average, certainly not exceeded 3000 during the last ten years, it is evident that such children as are habitually drugged with this compound must take a large quantity of opiate.\*

Even a larger quantity of opiate, in proportion to the population, is said to be sold in Nottingham than in Coventry; and it is supposed that a large number of children's deaths are caused by its use. A member of the Town Council, who was formerly a druggist, said that in a shop where he served his apprenticeship 13 cwts. of treacle per annum were manufactured into Godfrey's cordial. This would be equal to about 156 gallons of the cordial, each ounce of which was equivalent to a much larger proportion of opium than is contained in that now made. This large quantity was sold almost exclusively by retail. Of late years this form of opiate has been much less in request, and laudanum is now given to infants as its substitute. Another member of the Nottingham Town Council, likewise in the drug trade, deposed that he sells about 400 gallons of laudanum annually, at least one half of which he believes to be administered to infants. He refuses to sell the drug, except in properly labelled bottles, which adds to the cost, and tends to lessen the sale. Women, when remonstrated with on the subject of drugging their children with laudanum, say that they must keep their infants quiet, as their husbands and elder children, who have to work during the day, cannot do so if disturbed at night. Besides that sold by regular druggists, much opiate is also sold in most manufacturing towns by grocers and small shopkeepers, and a considerable quantity by druggists under other names, such as "Infants' Bottle," &c. Indeed there seems to be no doubt that the habitual administering of opiates to infants must be included among the causes of a high infantile mortality in certain manufacturing towns, not only on account of an over-dose being occasionally given, but also because infants kept in a state of continual narcotism will be thereby rendered disinclined for food, and be but imperfectly nourished.

## APPENDIX.

V. Local inquiries into Excessive mortality of young children.

Coventry, Nottingham, Blackburn, Birmingham, Wolverhampton, Merthyr Tydfil, and Abergavenny.

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\* The composition of Godfrey's cordial is variable, different druggists preparing it of different strengths. It contains less opiate at the present day than it did formerly, and 1 oz. by weight is said to be now equal to about  $2\frac{1}{2}$  grains of opium. Probably some is sold of less and perhaps some of greater strength. One druggist in Coventry said that the Godfrey's cordial sold in his shop contained 2 oz. of opium in 6 gallons; another, 1 drachm of opium in 3 pints; a third said that 4 pints of Godfrey contained 4 oz. of laudanum. According to a formula used in Nottingham, Godfrey's cordial consists of 1 cwt. of treacle, 11b. of opium, and 2 galls. of water, besides ginger and spices.



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Abundant proof of the large mortality among the children of female factory operatives was obtained during the inquiry. An operative of the better class in Birmingham reported that he collects money for the expenses attendant on the deaths of children among the workers in a factory where 150 women are employed, and that he believed 10 out of every 12 children born to the married women in this factory die within a few months after birth. He also confirmed the statements previously made by many other persons, that the women return to their work so early as a fortnight or three weeks after their confinement. Many married women were questioned, as opportunity served, in the several factories visited, regarding their families, the number of children they had borne, the number that survived, and the manner in which they were brought up. The evidence of these women tallied exactly with that of other persons, both as respects the nourishment of their children, the tendance of them during the mother's absence, and the large mortality among them. It was frequently found that two-thirds or three-fourths of the children born to these women had died in infancy; and, on the other hand, it was remarkable how, in other instances, the majority of the children were reared when the mothers did not work in factories, or discontinued doing so whilst nursing, or when the infants' supplementary food consisted partly or chiefly of milk.

The great evils with regard to children, which have been here shown to be incidental to the system under which married women work at various industrial occupations, are perfectly understood by many of the manufacturers and other inhabitants of some of the factory towns. The manager of a mill near Coventry said that in the factory under his direction it is permitted to take infants to the room appropriated for the meals of operatives, in order to be nursed by their mothers; but this, unfortunately, appears to be a solitary case. Infants' nurseries for the purpose of taking charge of infants while their mothers are at work, were at one time established in Coventry, but for some reason they have been discontinued. It is evident that in order to fulfil the purpose for which they are established such institutions should be situated in the immediate neighbourhood of, or rather, if possible, attached to the factories.

The results of the inquiry may be stated as follows :—

1st. The infantile death-rate bears no definite relation to the general death-rate, but their comparative proportions to each other vary in different districts.

2d. The infantile death-rate bears the largest proportion to the general death-rate in districts where the infantile population is specially exposed to unwholesome influences, as in Coventry, Nottingham, and certain other manufacturing towns.

3d. The unwholesome influences to which infants are exposed in the manufacturing towns comprised in the present inquiry may be attributed mainly to the industrial employment of the married women, which leads them to consign the tendance of their infants, at a very early age, to young children or strangers.

4th. That infants thus deprived of the mothers' care are habitually fed on diet ill adapted to their digestive powers, and are very frequently drugged with opiates, in order to allay the fractiousness arising from the illness induced by improper food.

5th. That infants in manufacturing towns where women are much engaged in factory labour are likewise exposed to other causes of sickness, proceeding from the ignorance or carelessness of the mothers or nurses, such as deficiency of exercise, and exposure to inclement weather.





















